



Digitized by the Internet Archive
in 2017 with funding from
Queen's University Archives

Queen's University

KINGSTON, CANADA



CALENDAR
OF
THE FACULTY OF APPLIED
SCIENCE
(SCHOOL OF MINING)

TWENTY-SEVENTH SESSION

1919-1920

KINGSTON

PRINTED FOR THE UNIVERSITY BY THE JACKSON PRESS

1919

1919

JANUARY							FEBRUARY							MARCH							APRIL								
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S		
.	.	.	.	1	2	3	4	1	1	.	.	.	1	2	3	4	5
5	6	7	8	9	10	11	2	3	4	5	6	7	8	2	3	4	5	6	7	8	6	7	8	9	10	11	12		
12	13	14	15	16	17	18	9	10	11	12	13	14	15	9	10	11	12	13	14	15	13	14	15	16	17	18	19		
19	20	21	22	23	24	25	16	17	18	19	20	21	22	16	17	18	19	20	21	22	20	21	22	23	24	25	26		
26	27	28	29	30	31	..	23	24	25	26	27	28	..	23	24	25	26	27	28	29	27	28	29	30	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	30	31	..	..	..	..	..	..	..	..	..	..	..	..

MAY							JUNE							JULY							AUGUST						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
.	.	.	.	1	2	3	1	2	3	4	5	6	7	..	..	1	2	3	4	5	..	..	..	..	..	1	2
4	5	6	7	8	9	10	8	9	10	11	12	13	14	6	7	8	9	10	11	12	3	4	5	6	7	8	9
11	12	13	14	15	16	17	15	16	17	18	19	20	21	13	14	15	16	17	18	19	10	11	12	13	14	15	16
18	19	20	21	22	23	24	22	23	24	25	26	27	28	20	21	22	23	24	25	26	17	18	19	20	21	22	23
25	26	27	28	29	30	31	29	30	..	..	..	..	..	27	28	29	30	31	..	..	24	25	26	27	28	29	30
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	31	..	..	..	..	..	..

SEPTEMBER							OCTOBER							NOVEMBER							DECEMBER						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
..	1	2	3	4	5	6	..	..	..	1	2	3	4	..	..	..	..	..	..	1	..	1	2	3	4	5	6
7	8	9	10	11	12	13	5	6	7	8	9	10	11	2	3	4	5	6	7	8	7	8	9	10	11	12	13
14	15	16	17	18	19	20	12	13	14	15	16	17	18	9	10	11	12	13	14	15	14	15	16	17	18	19	20
21	22	23	24	25	26	27	19	20	21	22	23	24	25	16	17	18	19	20	21	22	21	22	23	24	25	26	27
28	29	30	..	..	..	..	26	27	28	29	30	31	..	23	24	25	26	27	28	29	28	29	30	31	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	30	..	..	..	..	..	..	..	..	..	..	..	..	..

1920

[illegible]

TABLE OF CONTENTS.

	PAGE
Monthly Calendar	2
University Calendar	5
Junior and Honour Supplemental Matriculation Examinations.....	6
Time Table, April Examinations	7
Officers of Administration	8
University Senate	11
Officers of Instruction	12
Government and Administration	15
Historical Note	19
Expenses of a Course	21
Requirements for Admission	22
Subjects of Matriculation	22
Scholarships and Prizes.....	28
Regulations	31
Fees	34
Degrees	35
Courses of Study	38
Four Year Courses	38
Six Year Courses	52
Subjects of Study	54
English	54
German	55
French	56
Spanish	56
Economics	56
Mathematics	57
Physics	59
Chemistry	62
Geology	67
Mineralogy	73

	PAGE
Animal Biology	76
Bacteriology	77
Mining Engineering	77
Metallurgy	82
Chemical Engineering	84
Civil Engineering	86
General Engineering	86
Structural Engineering	88
Hydraulic Engineering	89
Railway Engineering	90
Municipal Engineering	91
Surveying	92
Engineering Field Work	94
Electrical Engineering	95
Mechanical Engineering	98
Thermodynamics	101
Drawing	103
Descriptive Geometry	103
Shop Work	104
Physical Training	105
Libraries	106
Engineering Society	110
No. 5 Field Company, C.E.	112
Queen's Y. M. C. A.	115
List of Graduates	116
List of Students	133
Time Table of Classes	136

CALENDAR

1919

- May 15, Thursday—Last day on which the Inspectors will receive notice, accompanied by fee, of candidates' intention of taking the Junior and Honour Matriculation examinations.
- June 30, Monday—Honour Matriculation examinations begin at the University and at all Collegiate Institutes and High Schools in Ontario.
- July 2, Wednesday—Junior Matriculation examinations begin at the University and at every Collegiate Institute and High School in Ontario.
- Aug. 30, Saturday—Applications, stating subjects and accompanied by fee, for Supplemental Pass examinations to be made to the Registrar.
- Aug. 30, Saturday—Notice, accompanied by fee, due at the Department of Education, Toronto, of candidates' intention to write on the Supplemental Matriculation examinations.
- Sept. 3, Wednesday—Shop Work for Courses F and G begins.
- Sept. 8, Monday—Supplemental Junior Matriculation Examinations begin.
- Sept. 22, Monday—Supplemental Pass Examinations begin.
- Oct. 8, Wednesday—Classes open (1st term), at 8 a.m.
- Oct. 10, Friday—Last day for registration without extra fee.
- Oct. 17, Friday—Last day of registration for students in Applied Science who have not perviously obtained from the Faculty permission to register later.
- Dec. 19, Friday—Christmas Holidays begin at 5 p.m.

1920

- Jan. 6, Tuesday—Classes re-open (2nd term) at 8 a.m.
- Feb. 18, Wednesday—Holiday (Ash Wednesday).
- April 1, Thursday—Last day for receiving applications for Engineering Field Work I.
- April 1, Thursday—Last day for receiving manuscripts and essays for prizes.
- April 1, Thursday—Last day for receiving applications and fees for examinations and graduation.
- April 2, Friday—Good Friday.
- April 21, Wednesday—Classes close at 5 p.m.
- April 22, Thursday—Examinations begin.
- April 27, Tuesday—Last day for receiving fees for Engineering Field Work I.
- May 10, Monday—Meeting of Faculty to consider reports of examiners.
- May 11, Tuesday—Engineering Field Work I begins.
- May 12, Wednesday—Convocation for distributing prizes, announcing honours and conferring degrees.

EXAMINATION TIME-TABLE

Supplemental Junior and Honour Matriculation

SEPTEMBER, 1919

	9.00-11.30 a.m.	1.30-4.00 p.m.
Sept. 8, Monday	Exp. Science (Phys.).	Brit. and Can. History
Sept. 9, Tuesday,	Exp. Science (Chem.).	Ancient History
Sept. 10, Wednesday	French Authors.	French Composition.
Sept. 11, Thursday	Latin Auth., Vergil, &c.	Latin Comp., Caesar, &c
Sept. 12, Friday	Geometry.	Eng. Literature.
Sept. 15, Monday	Algebra.	Eng. Composition.
Sept. 16, Tuesday	German Authors.	German Composition.
Sept. 17, Wednesday	Greek Authors.	Greek Composition.
Sept. 18, Thursday	{ Arithmetic.	English Grammar
	{ Trigonometry.	

At all examinations in Mathematics candidates should provide themselves with a protractor, a pair of compasses, and a ruler showing millimetres and sixteenths of an inch; and for the examination in Trigonometry a book of mathematical tables.

EXAMINATION TIME-TABLE

April, 1920

A.M.

P.M.

April 22....	Astronomy	Economics I.
Thursday		
April 23.....		Desc. Geometry.
Friday	Electrical Eng. I.....	Mun. Eng. IV.
	Electrical Eng. III.....	Electrical Eng. VI.
	Phys. Chem. III.....	Mechanical Eng. V.
		General Chem. III.
April 24.....	Gen. Chemistry I.....	Gen. Chem. II.
Saturday	Phys. Chem. I.....	Chemical Eng. II.
	Hydraulic Eng. I.....	Ry. Eng. & Struct. Eng. II.
		Anal. Chem. VII.
April 26.....	Physics I (Mechanics).....	Mineralogy I.
Monday	Elect. Eng. II.....	Geology VII.
	Geol. III.....	Phys. Chemistry II.
	Survey. IV & Struct. Eng. I.	Electrical Eng. IX. and XI.
	Indust. Chemistry I.....	Gen. Eng. V & Ind. Chem. II.
April 27.....	Math. I., Trigonometry.....	Mathematics II.
Tuesday	Gen. Eng. VI.....	Railway Eng. III.
	Mining I.	Mining II.
	Physics IV.	Organ. Chemistry III.
	Organ. Chem. II.....	Mechanical Eng. X
April 28.....	Mechanical Eng. VII.....	Physics II.
Wednesday		Biology.
		Economics II.
April 29.....	Surveying I.	Geology I.
Thursday	Gen. Engineering II.....	Geology VI.
	Geology II.	Mechanical Eng. IV.
		Physics III.
April 30.....	Math. I., Geometry.....	German.
Friday	Railway Eng. I.	General Eng. I.
	Ore Dressing	Struct. Eng. IV.
		Thermodynamics III.
		Chemical Eng. I.
		Mineralogy VI.
May 1.....	Physics I., Sound, Light, Heat	Organic Chem. I.
Saturday	Elect. and Mag.	Surveying VI.
	Thermodynamics II.	Surveying II.
	Geology V.	Electrical Eng. VII.
		Electrical Eng. VIII.
		Geology VIII.
		Municipal Eng. II.
May 3.....	Math. I., Algebra	Mathematics III.
Monday	Metallurgy I.	Electrical Eng. V.
		Mechanical Eng. VI.
		Metallurgy II.
		Geo. IX & Municipal Eng. III.
May 4.....	Jr. English	Mineralogy III and IV.
Tuesday	Mech. Eng. II.	Hydraulic Eng. II.
	Structural Eng. III.....	Mechanical Eng. IX.
	Surveying VII.	Metallurgy III.

OFFICERS OF ADMINISTRATION

CHANCELLOR

E. W. BEATTY, K.C.

PRINCIPAL AND VICE-CHANCELLOR

R. BRUCE TAYLOR, M.A., D.D.

PRINCIPAL EMERITUS

VERY REV. D. M. GORDON, D.D., LL.D., C.M.G.

RECTOR

JAMES W. ROBERTSON, LL.D., C.M.G.

VICE-PRINCIPAL

JOHN WATSON, M.A., LL.D., D.D., D.Litt.

REGISTRAR AND TREASURER

GEORGE Y. CHOWN, B.A.

THE BOARD OF TRUSTEES

Chairman

HAMILTON CASSELS, M.A., LL.D., K.C.

Ex-officio Members

E. W. BEATTY, K.C.	Chancellor
R. BRUCE TAYLOR, M.A., D.D.	Principal
JAMES W. ROBERTSON, LL.D., C.M.G.	Rector

Elective Members

Retire 1919

REV. W. J. CLARK, D.D. ⁶	Westmont, Que.
REV. D. R. DRUMMOND, M.A., D.D. ⁶	Hamilton
PRINCIPAL S. W. DYDE, M.A., D.Sc. ⁵	Kingston
J. M. FARRELL, B.A. ³	Kingston
LIEUT.-COL. R. W. LEONARD ²	St. Catharines
ALEX. LONGWELL, B.A., B.Sc. ¹	Toronto
D. M. MCINTYRE, B.A., K.C. ¹	Toronto
LIEUT.-COL. D. M. ROBERTSON, B.A., M.V.O. ³	Toronto

Retire 1920

H. A. CALVIN, ESQ. ²	Kingston
REV. W. T. HERRIDGE, B.A., D.D. ⁶	Ottawa
HON. JUSTICE W. A. LOGIE, M.A., LL.B. ⁶	Toronto
REV. G. M. MILLIGAN, D.D., LL.D. ⁶	Toronto
W. F. NICKLE, B.A., K.C., M.P. ¹	Kingston
W. H. RANKIN, M.D. ¹	Brooklyn, N.Y.
A. SHORTT, M.A., LL.D., C.M.G. ³	Ottawa

Retire 1921

A. T. DRUMMOND, B.A., LL.D. ⁶	Toronto
VERY REV. D. M. GORDON, D.D., LL.D., C.M.G. ²	Kingston
JUDGE H. A. LAVELL, B.A. ³	Kingston
JAMES A. MINNES, ESQ. ¹	Kingston
H. M. MOWAT, B.A., LL.B. ¹	Toronto
J. K. MACDONALD, ESQ. ⁶	Toronto
VERY REV. M. MACGILLIVRAY, M.A., D.D. ⁶	Kingston
SIR J. S. WILLISON, LL.D. ³	Toronto

Retire 1922

HAMILTON CASSELS, M.A., LL.D., K.C. ⁶	Toronto
G. F. HENDERSON, B.A., K.C. ²	Ottawa
ANDREW HAYDON, M.A., K.C. ⁶	Ottawa
ALD. R. E. KENT ⁴	Kingston
W. G. MILLER, LL.D. ⁴	Toronto
E. R. PEACOCK, M.A. ⁶	London, Eng.

Retires 1923

T. B. CALDWELL, ESQ. ⁴	Lanark
---	--------

Retire 1924

R. CRAWFORD, B.A. ⁴	Kingston
M. J. O'BRIEN, ESQ. ⁴	Renfrew

¹Elected by the University Council.

²Elected by the Benefactors.

³Elected by the Graduates.

⁴Appointed to represent the Faculty of Applied Science.

⁵Elected by the Faculty of Queen's Theological College.

⁶Elected by the Board of Trustees from among its own members.

THE UNIVERSITY COUNCIL

Registrar

J. M. FARRELL, B.A.

Ex-officio Members

THE CHANCELLOR

THE PRINCIPAL

THE MEMBERS OF THE BOARD OF TRUSTEES

THE MEMBERS OF THE SENATE

Elective Members

Retire 1919

REV. J. A. DONNELL, M.A.	Haileybury
JOHN DONNELLY, M.E.	Kingston
MRS. H. A. LAVELL, B.A.	Kingston
H. M. MOWAT, B.A., LL.B., K.C.	Toronto
F. J. POPE, M.A., Ph.D.	New York
CLIFFORD E. SMITH, Esq.	Toronto
REV. JAMES G. STEWART, B.A.	London
REV. JAS. WALLACE, M.A., B.D.	Kingston

Retire 1920

E. T. CORKILL, B.Sc., M.E.	Copper Cliff
JUDGE A. G. FARRELL, B.A.	Regina, Sask.
G. F. HAMILTON, M.A.	Ottawa
REV. J. W. MCINTOSH, M.A.	Prince Albert
MISS EDNA POOLE, B.A.	Toronto

Retire 1921

REV. JAMES BINNIE, M.A., B.D.	Parry Sound
D. D. CALVIN, B.A.	Toronto
T. H. FARRELL, M.A., M.D.	Utica, N.Y.
FRANCIS KING, M.A.	Kingston
D. A. MCARTHUR, M.A.	London
REV. D. STRACHAN, B.A., D.D.	Toronto
MISS VICTORIA REID, B.A., M.D.	Toronto
E. C. WATSON, M.A., M.D.	Detroit, Mich.

Retire 1922

R. W. BROCK, M.A.	Vancouver, B.C.
G. Y. CHOWN, B.A.	Kingston
R. H. COWLEY, M.A.	Toronto

JUDGE E. B. FRALECK, B.A.	Belleville
REV. D. MCTAVISH, M.A., D.Sc.	Toronto
REV. W. W. PECK, M.A., LL.B.	Kamloops, B.C.
W. H. RANKIN, M.D.	Brooklyn, N.Y.

Retire 1923

REV. J. D. BOYD, B.A.	Kingston
REV. N. M. LECKIE, B.A., B.D.	Galt
MRS. J. MACGILLIVRAY, M.A.	Kingston
F. J. MCCAMMON, B.A., M.D.	Brooklyn, N.Y.
D. M. MCINTYRE, M.A., K.C.	Toronto
REV. J. H. TUBNBULL, M.A.	Toronto
J. B. TURNER, B.A.	Hamilton

Retire 1924

ALEX. H. BEATON, B.A.	Toronto
E. L. BRUCE, B.A., B.Sc. Ph.D.	Ottawa
REV. EBER CRUMMY, B.Sc., D.D.	Winnipeg
ARTHUR B. CUNNINGHAM, B.A.	Kingston
JAMES A. MINNES, ESQ.	Kingston
R. S. MINNES, M.A., M.D.	Ottawa
WILSON S. MORDEN, B.A., LL.D.	Toronto
J. J. MACLENNAN, B.A.	Toronto
MISS MARION REDDEN, B.A.	Kingston

THE SENATE

Ex-officio Members

R. BRUCE TAYLOR, M.A., D.D.	Principal
JOHN WATSON, M.A., D.D., LL.D.	Vice-Principal
JAMES CAPPON, M.A., LL.D.	Dean of the Faculty of Arts
WM. L. GOODWIN, B.Sc., D.Sc.	Dean of the Faculty of Applied Science
J. C. CONNELL, M.A., M.D.	Dean of the Faculty of Medicine
H. T. J. COLEMAN, Ph.D.	Dean of the Faculty of Education
REV. S. W. DYDE, M.A., D.Sc.	Principal of Queen's Theological College

Elective Members

The Faculty of Arts

J. F. MACDONALD, M.A.	Retires 1920
A. S. FERGUSON, M.A.	Retires 1921
W. E. MCNEILL, M.A., Ph.D.	Retires 1922

The Faculty of Applied Science

W. C. BAKER, M.A.	Retires 1920
E. W. HENDERSON, B.Sc.	Retires 1921
L. F. Goodwin, A.C.G.I., Ph.D.	Retires 1922

The Faculty of Medicine

G. E. KIDD, B.A., M.D.	Retires 1920
A. P. LOTHROP, M.A., Ph.D.	Retires 1920
J. F. SPARKS, B.A., M.D.	Retires 1920

The Faculty of Queen's Theological College

REV. WILLIAM MORGAN, M.A., D.D.	Retires 1919
REV. H. T. WALLACE, B.A., Ph.D.	Retires 1920

OFFICERS OF INSTRUCTION

I.—EMERITUS PROFESSORS

D. H. MARSHALL, M.A., F.R.S.E., <i>Emeritus Professor of Physics,</i>	Union Street
REV. JAMES FOWLER, M.A., F.R.S.C., <i>Emeritus Professor of Botany,</i>	121 Union Street
WM. NICOL, M.A., <i>Emeritus Professor of Mineralogy,</i>	203 Albert Street
S. F. KIRKPATRICK, M.Sc., <i>Emeritus Professor of Metallurgy,</i>	Ottawa

II. IN THE FACULTY OF APPLIED SCIENCE

WILLIAM L. GOODWIN, B.Sc., D.Sc., F.R.S.C., <i>Professor of Chemistry and Dean of Faculty,</i>	Alice Street
L. W. GILL, M.Sc., <i>Professor of Electrical Engineering,</i> (Major, on active military service)	
J. C. GWILLIM, B.Sc., <i>Professor of Mining Engineering,</i> (On leave of absence)	
A. L. CLARK, B.Sc., Ph.D., <i>Professor of Physics, and Director of Research,</i>	200 Albert Street
M. B. BAKER, B.A., B.Sc., F.G.S.A., <i>Professor of Geology,</i>	45 William Street

- W. P. WILGAR, B.Sc.,
Professor of Civil Engineering,
(Major, on active military service)
45 William Street
- G. L. GUILLET, M.Sc.,
Professor of Mechanical Engineering.
144 Union Street
- L. F. GOODWIN, A.C.G.I., Ph.D., F.I.C.,
Professor of Industrial Chemistry and Chemical Engineering,
22 Livingstone Ave.
- G. J. MACKAY, B.Sc.,
Professor of Metallurgy,
242 Brock Street
- N. L. BOWEN, M.A., B.Sc.,
Professor of Mineralogy,
142 Lower Albert Street
- C. W. DRURY, B.Sc., Ph.D.,
Professor of Electro-Metallurgy and Metallurgical Research,
Nicol Hall
- S. N. GRAHAM, B.Sc.,
Acting Professor of Mining,
Nicol Hall
- J. B. HARVEY, M.Sc., A.M.E.I.C.,
Acting Professor of Civil Engineering,
135 Centre Street
- W. C. BAKER, M.A.,
Associate Professor of Physics,
132 Earl Street
- JOHN WADDELL, B.A., D.Sc., Ph.D.
Assistant Professor of Chemistry,
104 Frontenac Street
- E. W. HENDERSON, B.Sc.,
Assistant Professor of Electrical Engineering,
(Major, on active military service)
- LINDSAY MALCOLM, M.A., B.Sc., O.L.S., D.L.S.,
Assistant Professor of Civil Engineering,
(Major, on active military service)
- D. S. ELLIS, M.A., B.Sc., O.L.S., D.L.S.,
Assistant Professor of Applied Mathematics,
(Major on active military service)
- J. A. MCRAE, M.A., F.I.C.,
Assistant Professor of Chemistry,
184 University Avenue
- J. K. ROBERTSON, M.A.,
Assistant Professor of Physics,
105 Lower Albert Street

- E. FLAMMER, B.Sc., Ph.D.,
Assistant Professor of Physics,
55 Alfred Street
- L. S. EATON, M.E.,
Assistant Professor of Mechanical Engineering,
45 William Street
- J. L. MCKEE, B.A., M.Sc., Ph.D.,
Assistant Professor of Chemistry,
144 Union Street
- A. M. SQUIRE, B.Sc.,
Lecturer in Draughting,
2 Kensington Avenue
- D. M. JEMMETT, M.A., M.Sc.,
Lecturer in Mathematics,
356 Albert Street
- C. W. GREENLAND, B.Sc.,
Lecturer in Geology and Mineralogy,
14 William Street
- F. ETHERINGTON, L.R.C.P. and S. (Edin.), C.M.G.,
Medical Adviser.
(Colonel, on active military service)
- J. WADDELL, B.A., D.Sc., Ph.D.,
Librarian.
132 Earl Street
- G. Y. CHOWN, B.A.,
Registrar and Treasurer,
Union Street West

ASSISTANTS AND FELLOWS

- W. H. SLINN, B.Sc.,
Assistant in Civil Engineering.
- S. C. MORGAN, B.Sc.,
Laboratory Assistant in Physics.
- MARY H. RUTHERFORD,
Demonstrator in Physics.
- A. C. BAIDEN,
Instructor in Shop Work.

DOUGLAS TUTORS

- J. BUSS, H. C. FLEMING, A. R. GARRETT, B.A., L. H. J. C. DE LA FRANIER,
H. ROWLEY, M.A., T. A. SIMS, G. L. MACKENZIE.

PROFESSORS OF THE ARTS FACULTY WHOSE CLASSES ARE ATTENDED BY STUDENTS OF THE FACULTY OF APPLIED SCIENCE

English	{ J. F. MACDONALD, M.A. W. D. TAYLOR, M.A.
<i>Animal Biology</i>	A. P. KNIGHT, M.A., M.D.
German	{ JOHN MACGILLIVRAY, Ph.D. THURE HEDMAN, Ph.B.
French	R. K. HICKS, M.A.
Spanish	J. H. BROVEDANI, D.-ès-L.
	{ J. MATHESON, M.A.
Mathematics	{ D. BUCHANAN, M.A., Ph.D. C. F. GUMMER, M.A.
Economics	{ O. D. SKELTON, M.A., Ph.D. H. MICHELL, M.A.
Bacteriology	PROF. W. T. CONNELL, M.D.

GOVERNMENT AND ADMINISTRATION

The administration of the University is vested in: the Board of Trustees, the University Council, the Senate, and the Faculty Boards.

THE BOARD OF TRUSTEES

The Board of Trustees consists of *ex-officio* and elective members. The former are the Chancellor, the Principal, and the Rector. The latter consists of (1) one representative from each affiliated college, (2) representatives as provided for by the Statutes from (a) the University Council, (b) the Benefactors, (c) the Graduates, and (3) members elected by the Board of Trustees.

The functions of the Board of Trustees are to manage the finances, to possess and care for the property, to procure legislation, to appoint instructors and other officers, and in general to attend to such external matters as do not relate directly to instruction.

THE UNIVERSITY COUNCIL

The University Council consists of the Chancellor, the Trustees, the members of the Senate, and an equal number of members—graduates or alumni—elected by the graduates.

The Chancellor is elected by the Council, except when two or more candidates are nominated, in which case the election is by registered graduates and alumni. He holds office for three years; and, as the highest officer of the University, presides at meetings of the Council, at Convocation and at statutory meetings of the Senate. In his absence he is represented by the Vice-Chancellor.

The Functions of the Council are:

- (1) To elect six trustees, two of whom shall retire annually.
- (2) To make by-laws governing the election of (*a*) the Rector by the registered students, (*b*) four trustees by the benefactors, (*c*) six trustees by the University Council, (*d*) six trustees by the graduates.
- (3) To discuss all questions relating to the University and its welfare.
- (4) To make representation of its views to the Senate or the Board of Trustees.
- (5) To decide on proposals for affiliation.
- (6) To arrange all matters pertaining to (*a*) its own meetings and business, (*b*) the meetings and proceedings of Convocation, (*c*) the installation of the Chancellor, (*d*) the fees for membership, registration, and voting.

The annual meeting of the Council is held on the Tuesday immediately preceding Convocation.

THE SENATE

Until 1913 the Senate was composed of all the Professors, Associate Professors, and Assistant Professors on the staff of the University. It transacted all business relating to the work of instruction, the arrangement of classes, the conduct of examinations, and the ward of standing, having charge in general of the internal administration of the University.

In 1913, however, Faculty Boards were created to relieve the Senate of much work which, owing to the growth of the University, had increasingly devolved upon it, and at the same time the Senate was made a representative body composed of certain members of the various Faculties.

The Senate now consists of :

The Principal.

The Vice-Principal.

The Principal of Queen's Theological College.

The Dean of the Faculty of Arts.

The Dean of the Faculty of Medicine.

The Dean of the Faculty of Applied Science.

The Dean of the Faculty of Education.

Three Professors elected by the Faculty of Arts.

Two Professors elected by the Faculty of Queen's Theological College.

Three Professors elected by the Faculty of Medicine.

Three Professors elected by the Faculty of Applied Science.

The Functions of the Senate are :

(1) To determine all matters of an academic character which concern the University as a whole.

(2) To consider and determine all courses of study leading to a degree, including conditions of Matriculation, on recommendation of the respective Faculty Boards; but the Senate shall not embody any changes without having previously presented these to the Faculty.

(3) To recommend to the Board of Trustees the establishment of any additional Faculty, Department, Chair, or Course of Instruction in the University.

(4) To be the medium of communication between the Alma Mater Society and the Governing Bodies.

(5) To determine all regulations regarding the social functions of the students within the University, and regarding the University Library and University Reading Rooms.

(6) To publish the University Calendar.

(7) To conduct examinations.

(8) To grant Degrees.

(9) To award University Scholarships, Medals, and Prizes.

(10) To enforce the Statutes, Rules, and Ordinances of the University.

(11) And generally, to make such recommendations to the Governing Boards as may be deemed expedient for promoting the interests of the University.

THE FACULTY BOARDS

The Faculty Boards are constituted as follows:

For the Faculty of Arts and for the Faculty of Applied Science, the Dean, Professors, Associate Professors, Assistant Professors, and Lecturers of each Faculty have power to meet as separate boards, and to administer the affairs of each Faculty under such regulations as the Board of Trustees may prescribe.

For the Faculty of Medicine, the Dean, Professors, Associate Professors, and Assistant Professors have power to meet as a separate board, and to administer the affairs of the Faculty under such regulations as the Board of Trustees may prescribe.

The Principal is *ex-officio* president and a member of each of the foregoing Faculty Boards. In his absence from the Arts Faculty the Vice-Principal shall preside. In his absence from the Medical Faculty, or from the Faculty of Applied Science, the Dean of the Faculty shall preside.

The Functions of the Faculty Boards are:

- (1) To recommend to the Senate courses of study leading to a degree, and the conditions of admission.
- (2) To decide upon applications for admission or for change of course, subject to the regulations of the Senate.
- (3) To submit to the Senate names for both ordinary and honorary degrees.
- (4) To arrange the time-table for classes and to edit the Faculty Calendar, subject to the approval of the Senate.
- (5) To control registration, and determine the amount of fees and manner of payment, subject to the regulations of the Senate.
- (6) To deal with class failures.
- (7) To exercise academic supervision over students.
- (8) To make such recommendations to the Senate as may be deemed expedient for promoting the efficiency of the University.
- (9) To award Faculty Scholarships, Medals, and Prizes.
- (10) To appoint such sessional assistants, fellows, tutors, and demonstrators as shall be needed to give instruction in the subjects taught by the Faculty.
- (11) To pass such regulations and by-laws as may be necessary for the exercise of the functions of the Faculty.

HISTORICAL NOTE

The School of Mining was founded in 1893 under an Ontario Charter which placed its management in the hands of a Board of Governors elected by its shareholders, i.e., the subscribers to its funds. While originally a Mining School it has been expanded to include courses of study for degrees in mining and metallurgy, in civil, mechanical, electrical and chemical engineering, in analytical chemistry and assaying, and in geology and mineralogy. The objects of the institution were to provide thorough instruction, both theoretical and practical, in the above and other branches of applied science, and to adapt courses of study and methods of presentation to the conditions prevailing in Canada, so as to secure as nearly as may be a maximum usefulness to the country.

For several sessions all its Departments were housed in Carruthers Science Hall which had been erected in 1889, but in view of the rapid success and increased requirements of the School the Provincial Legislature in 1900 provided for its accommodation two large buildings, Ontario Hall for the Departments of Mineralogy, Geology, and Physics, and Fleming Hall for the Departments of Civil, Mechanical, and Electrical Engineering. More recently the Provincial Government erected Gordon Hall, which is entirely devoted to Chemistry; and, through the generosity of Professor Nicol and other graduates, Nicol Hall has been built for the accommodation of the class rooms and laboratories of the Department of Mining and Metallurgy. These changes permitted the Civil Engineering Department to move into Carruthers Hall, leaving room in Fleming Hall for the already overcrowded departments of Electrical and Mechanical Engineering.

* From its inception the School of Mining was closely connected with the University. The students of the School of Mining received their degrees from the University and the graduates in Science enjoy the same rank and privilege as other graduates in representation upon the University Council and in the election of University Trustees. The staff of the School of Mining constituted practically the Science Faculty of the University, some of its members being actively connected also with the Arts and Medical Faculties, and

the Faculty being represented equally with other faculties on the Senate of the University.

The School of Mining was formerly under the control of a separate board of Governors, but in the year 1916 it became the Faculty of Applied Science of Queen's University.

Kingston is well situated as the seat of a college of engineering and applied science. Geology and mineralogy, two of the fundamental subjects of a mining engineer's education and also important in other scientific professions, are studied to best advantage where the minerals can be seen as they lie in nature, and where geological formations can be examined *in situ*. In a few hours a class of students can be taken by carriage to a region so rich in mineral species that about forty different kinds have been secured in an afternoon. There are several geological formations out-cropping within easy walking distance of the city. If to this be added the accessibility by a short railway journey, of mines in operation, it will be seen the opportunities for instructive demonstrations to classes in mineralogy, geology, and mining are very numerous. The metallurgical works at Deloro, eighty miles from Kingston, are also open to our students. It is thus possible to give to the study of mineralogy, geology, mining and metallurgy, that practical turn which not only adds interest to the college course, but shortens the period between graduation and the attainment of proficiency and confidence in professional work.

The variety of topographical features in the surrounding country affords the best of material for practice in all branches of surveying, including railway, topographic, hydrographic and land surveying. The main line of the Grand Trunk passes through Kingston which is also a terminus of branches of the Canadian Pacific and Canadian Northern Railways. The Canadian Locomotive Works, which are the largest locomotive shops in Ontario, are within ten minutes walk of the University, and are open to our students for study and for assisting in engine testing and similar work. Kingston has two Dry Docks, one of which, the large Dominion Government Dock, is now under lease to the Kingston Ship Building Co., in whose yards steel construction can be practically studied. The locks of the Rideau Canal can be visited at Kingston

Mills, six miles from the heart of the city. There are also several water powers within easy distance, some of which are as yet awaiting development, while others can be seen in use at Gananoque (eighteen miles distant), at Trenton (sixty miles distant), and at other points. Students of civil, mechanical and electrical engineering thus have easy access to practical illustrations of their professional studies.

EXPENSES.

The following statement of expenses for a session is made from information obtained from students who have kept an account of their expenditures. Personal expenses are not included in the estimates. The average expense for class fees is included in this estimate:

Class and other fees	\$105.00 to \$125.00
Board, lodging and washing	150.00 to 200.00
Books and Stationery	15.00 to 25.00
*Incidentals	10.00 to 20.00
Excursions, Field and Technical	8.00 to 12.00
	<hr/>
	\$288.00 to \$382.00

The average student now pays for board from \$4.50 to \$5.00 a week; and room from \$1.25 to \$2.00 a week.

*Subscriptions to students' societies, hospital ticket, etc., but no personal expenses are included in incidentals.

The fee for graduation or for allowance of classes is not included in the estimates.

HOSPITAL PRIVILEGES.

Every student is now required to pay the Hospital fee of three dollars, for which the Governors of the Kingston General Hospital agree to give all the advantages of a private room, including room, board, attendance of nurses in training, and ordinary medicines, to those students requiring medical or surgical treatment, from October 1st to May 1st.

REQUIREMENTS FOR ADMISSION.

A regular student who has complied with the entrance requirements may proceed to examinations leading to a degree.

A candidate may obtain admission as a regular student by passing the Junior Matriculation, or some equivalent examination, as follows:—

I. JUNIOR MATRICULATION.—The subjects of Junior Matriculation examinations, or of Normal Entrance, required for admission to the Faculty of Applied Science are English Composition, English Literature, Mathematics, History (British and Canadian), together with any two of the following: Latin, Greek, French, German, and Experimental Science. The pass standard for each paper is forty per cent. of the marks assigned to it, but the average marks obtained on the Junior Matriculation papers must be sixty per cent., with such modifications or exceptions as may be deemed proper in consideration of the total number of marks and the reports of the Principals.

For syllabus of work covered by the examination see pamphlet on Matriculation issued by Queen's University, a copy of which will be sent upon application to the Registrar.

A candidate who has obtained the average of sixty per cent. on all the papers but has failed to obtain forty per cent. in one or two or at most three of these papers, may complete Junior Matriculation by passing on these papers at any one subsequent examination.

A candidate who has obtained forty per cent. on each of at least eight papers with an average of sixty per cent. will be credited with these papers. In order to complete Matriculation he must obtain at one subsequent examination forty per cent. on each of the remaining papers with an average of sixty per cent.

NOTE.—*In order to meet the special conditions resulting from the war, the University suspended its Matriculation requirement of pass standing in the Honour papers in Mathematics. Special instruction was given to first year students entering without the higher standing. This arrangement has proved highly satisfactory, and will*

be continued as long as the conditions which made it advisable remain. When the conditions of the country again become normal, it may prove advisable to require pass standing in the honour papers in one or two other subjects as well as in Mathematics, in order to provide a full year's work in the High School after Junior Matriculation grade.

II. EQUIVALENT EXAMINATION.—Candidates presenting any of the following certificates will receive *pro tanto* standing:

Prince Edward Island ...	First Class Teachers Licenses. Second and Third Year Certificates of Prince of Wales College.
Nova Scotia	Grade XI
New Brunswick	Class I
Quebec	Academy Grade III. University School Leaving Certificate.
Manitoba	Grade XI Engineering Matriculation
Saskatchewan	Middle Form
Alberta	Grade XI
British Columbia	Intermediate Grade with Science of Senior Grade.

NOTE.—A certificate from any school which is on the list of schools approved by any University or Technical College of recognized standing in the United States will be accepted as equivalent to matriculation examinations *pro tanto*.

Graduates of schools especially approved by the University are admitted, without condition, on the certificate of the Head Master.

Candidates from Technical Schools will be admitted to the courses in the Faculty of Applied Science on the following conditions:—

(a) That the candidate has completed a four-year course in the School.

(b) That he present a certificate, signed by the Principal of the School, and satisfactory to the University, giving his standing in the various subjects in each of the four years of his course.

(c) That copies of the examination papers on which he has made the fourth year standing certified under (b) in Mathematics, English, Science and History be sent to the University and be approved by the University as equivalent to matriculation grade. The syllabus on which these examinations are set is understood to be that of the individual school and not necessarily that prescribed by the University Matriculation Board. Under similar conditions, French or German may be included in this list of subjects, otherwise one of these languages will be required in the first year at the University.

III. ALLOWANCE ON CERTIFICATES.—A student who has already taken, in a University Arts or Science Faculty or in a recognized technical or military school, subjects included in a course in the Faculty of Applied Science will, on entering upon a course for the degree of B.Sc., be admitted to the year for which he is qualified.

A student who has completed the first year of the general Engineering course in one of the following Universities:—British Columbia, Mount Allison, Acadia, Alberta and Saskatchewan, will be admitted to the second year of any of the courses in Engineering in Queen's University.

A student who has completed the second year of the general Engineering course in one of the following Universities:—British Columbia, Mount Allison, Acadia, Alberta and Saskatchewan, will be admitted to the third year of courses in Mining, Civil, Mechanical, or Electrical Engineering at Queen's University.

A student who has completed the second year of the course in Chemistry at the University of British Columbia will be admitted to the third year of a course in Analytical and Applied Chemistry, Mineralogy and Geology or Chemical and Metallurgical Engineering at Queen's University.

Graduates of the Royal Military College will be allowed two years of the four year courses for a degree in the faculty of Applied Science.

IV. SPECIAL MATRICULATION.—A candidate who is actually engaged in a mercantile, industrial, or other occupation may proceed to pass Junior Matriculation under the following conditions:—

(a) He may present himself for one or more subjects at any July or September Examination.

(b) At any such Examination he will receive credit for a subject or subjects on obtaining 40 per cent. in each paper and an aggregate of 60 per cent. of the total marks assigned to such subject or subjects. There are two papers given in each subject.

(c) Matriculation must be completed under these conditions within four consecutive years.

In order to secure credit for the subject or subjects written, a candidate who desires to matriculate under these regulations must, immediately on receipt of his Departmental statement of marks, return the same to the Deputy Minister of Education accompanied by a certificate from his employer to the following effect:—

..... 191....

I,.....do hereby certify that.....
was in my employ from.....to.....in the
capacity ofand that this employment made it
impossible for him to attend the regular day sessions of a secondary
school. My business is that of
located at

Give business address in full

.....

Signature in full

To the Deputy Minister of Education.

V. SUPPLEMENTAL MATRICULATION.—1. The Supplemental Pass Junior Matriculation examination is conducted by the Department of Education for the University Matriculation Board, at the following centres:—

(a) The University of Toronto; Queen's University, Kingston; McMaster University, Toronto; Western University, London.

(b) Any of the following, upon request:—Windsor, Chatham, Sarnia, St. Thomas, London, Woodstock, Brantford, Simcoe, Cayuga, Welland, St. Catharines, Hamilton, Goderich, Stratford, Kitch-

ener, Guelph, Walkerton, Owen Sound, Orangeville, Barrie, Whitby, Bowmanville, Cobourg, Lindsay, Peterborough, Belleville, Picton, Napanee, Brockville, Kemptville, Prescott, Morrisburg, Cornwall, Alexandria, Vankleek Hill, Ottawa, Smith's Falls, Renfrew, Bracebridge, North Bay, Sault Ste. Marie, Port Arthur, Haileybury.

(c) Elsewhere in Ontario, upon request, and if approved by the University Matriculation Board.

(d) Elsewhere in Canada, upon request of one of the aforesaid Universities and approval of the Board.

2. Applications to write on the examinations, accompanied by the necessary fee, will be received at the Department of Education as follows:—

(a) Up to August 31st, from those who wish to write at any centre authorized in Ontario.

(b) Up to August 25th, from those who wish to write elsewhere in Ontario.

(c) Up to August 1st, from those who, through one of the aforesaid Universities, make application to write outside of the Province of Ontario.

3. On payment of the required fee with one dollar additional, a candidate who has failed to make application as specified in the foregoing regulation (2) may be admitted to examination at a centre already established, provided the accommodation is adequate and the number of question papers is sufficient.

4. The subjects of the examination, the prescription of work and the standard required shall be the same as for the annual Pass Junior Matriculation examination of the same year.

5. The following are eligible to become candidates at this examination:—

(a) Those who are applicants for the complete Matriculation examination.

(b) Those who are completing this examination under the regulations in force in any previous year.

(c) Those who are applicants for matriculation standing in certain subjects.

6. Candidates who present themselves under 5 (a) and pass the complete examination for Matriculation in any one year will be granted Departmental certificates of Pass Junior Matriculation. All other candidates will receive statements of their standing.

7. Candidates other than those mentioned in 5 may be admitted to the examination for the purpose of qualifying for a standing other than that of Departmental Matriculation.

8. The fee for writing on the Supplemental Examination shall be \$2.00 for each paper or half paper, with a maximum fee of \$10.00.

9. (a) Candidates may write at any one of the four University centres mentioned in 1 (a) without any additional cost to themselves.

(b) Candidates who write at any other centre, in addition to paying the fee required in (8), must also defray the local expenses of conducting the examination. These include the cost of supplies, any charge for the examination room, express charges, and the allowance to the presiding officer at \$4 per day.

10. The regular uniform examination books shall be used at this examination, and the examination shall be conducted, *mutatis, mutandis*, under the instructions governing the annual Midsummer examinations.

11. Forms of application, the time-table of the examinations, and further particulars may be obtained on application to the Department of Education, Toronto.

SPECIAL STUDENTS

Students not proceeding to a degree may take any classes for which they are prepared. The work in all classes is so arranged that those who wish to study either for scientific interest or to improve their present qualifications for any particular post, may profitably pursue their studies in the Faculty of Applied Science.

The Faculty will admit under this paragraph, as special students, only such candidates as are fitted to take part of the classes of a course. It will not admit as special students those whom on account of previous poor records, it is no longer desirable to continue as regular students.

Prospective students under this section should correspond with the Dean of the Faculty of Applied Science in regard to the arrangement of such a course.

SCHOLARSHIPS AND PRIZES.

1. EXHIBITION OF 1851 SCIENCE RESEARCH SCHOLARSHIP.

This scholarship, of the annual value of £150 stg., is awarded by Her Majesty's Commissioners for the Exhibition of 1851 to students who have given evidence of capacity for original research, and (except in very special circumstances) are under 30 years of age.

The nominee must be a British subject, must have been a *bona fide* student of Queen's University for three years, must have been a student of the University for a full year immediately before his nomination, must be a student of the University at the time of his nomination, (or he must have been a student at the University for a full year ending within twelve months prior to his nomination and since ceasing to be such student must have been engaged solely in scientific study) and must pledge himself not to hold any position of emolument whilst holding the scholarship. He is recommended to the commissioners by the Senate of the University. The scholarship may be held for a second year, if the report of the first year's work be satisfactory to the Commissioners. The scholar will, in the absence of special circumstances, be required to proceed to an institution other than that by which he is nominated, and there pursue some investigation likely to promote technical industries or scientific culture. The particular investigation the student proposes to pursue must be stated before a scholarship can be awarded.

Students of the Faculty of Applied Science are eligible for this scholarship.

The 1851 Science Research Scholars from Queen's University are the following:—

Norman R. Carmichael, M.A., 1893-4.

Thomas L. Walker, M.A., 1895-6.

Frederick J. Pope, M.A., 1897-8.

Wm. C. Baker, M.A., 1900-1.

C. W. Dickson, M.A., 1901-2-3.

C. W. Knight, B.Sc., 1904-5.

F. H. MacDougall, M.A., B.Sc., 1905-6.

C. Laidlaw, B.A., M.D., 1907-8.

N. L. Bowen, M.A., B.Sc., 1909-10.

Walter A. Bell, B.Sc., 1911-12.

J. R. Tuttle, M.A., 1913-14.

R. C. Cantelo, B.Sc., 1915-16.

2. THE M. L. HERSEY FELLOWSHIP IN CHEMISTRY.—This Fellowship of the annual value of \$500, has been endowed by Milton L. Hersey, M.Sc., LL.D., of Montreal. It is open to graduates of all universities and technical colleges. The holder of the Fellowship is expected to assist in the department of Chemistry and to devote part of his time to research.

Applications addressed to the Registrar of Queen's University, Kingston, Ont., stating qualifications and enclosing recommendations will be received up to July 31st.

3. THE KENNETH B. CARRUTHERS SCHOLARSHIP IN MINING AND METALLURGY. Value \$250.00. Given in memory of Kenneth B. Carruthers, who was killed at Passchendaele in October, 1917. Awarded to a graduate in Mining or Metallurgy. The holder must submit a thesis covering research work on a problem dealing with (1) Mining and Ore Dressing, (2) Metallurgy.

4. THE SIR SANDFORD FLEMING PRACTICAL SCIENCE SCHOLARSHIP.—Value \$70. Given by the late Chancellor of the University, Sir Sandford Fleming, C.E., K.C.M.G., LL.D. Awarded to the student of the Faculty of Applied Science obtaining the highest average on the examinations at the end of the first year.

5. THE N. F. DUPUIS SCHOLARSHIP.—This scholarship has been founded by the graduates as a mark of their appreciation of the long and effective services of Dr. N. F. Dupuis, as Dean of the Faculty and Professor of Mathematics. The scholarship is of the

value of \$60, and is awarded to the student who makes the highest marks in Mathematics I at the April Examinations.

6. THE J. B. CARRUTHERS SCHOLARSHIP.—This scholarship, of the value of \$50, the gift of J. B. Carruthers, Esq., of Kingston, is awarded annually to the student of the first year who makes the second highest average of marks in the subjects of the first year.

7. THE A. E. SEGSWORTH PRIZE.—This is a prize of the value of \$50 founded by R. F. Segsworth, Esq., Toronto, in memory of his brother, A. E. Segsworth, B.A., Ph.D. The prize is awarded to the student of any year who hands in before December 1st the best account of his previous summer's experience in practical underground mining.

8. THE DR. WILLIAM MOFFAT SCHOLARSHIP.—This scholarship of \$50 has been founded by Dr. William Moffat, of Utica, and is awarded annually to the student making the highest standing in first year chemistry. The award will be made on combined results of class work and examination and students in both Arts and Science will be eligible.

9. CANADIAN MINING INSTITUTE PRIZES.—Premiums and prizes at the discretion of the Council, may be given annually for papers read by students during the year. Any such award shall be made by the Council within three months after the Annual Meeting.

10. ENGINEERING SOCIETY PRIZES.—The Engineering Society of Queen's University offers two prizes of \$15.00 and \$10.00 for the two best papers on scientific subjects, by members of the society. These papers must be read before the society, and five papers, at least, must be presented before the prizes will be awarded. These prizes are open for competition to all students of Engineering.

11. THE SCIENCE '11 SCHOLARSHIP.—This scholarship, founded as a memorial by the graduating class of 1911 (Science), will be awarded in accordance with the following regulations:—

(a) Each department shall value—as a percentage—the term work of each student in each class of the second year as given in the syllabus of the courses in the calendar.

(b) Each department shall be free to employ whatever methods it may find most suitable in the determination of the value of the term work of the various students.

(c) The scholarship shall be awarded by the Faculty to the student whose average percentage shall be found to be the highest; it being understood that this average has been taken all over the second year classes of the particular course for which the student is registered.

12. THE DOUGLAS TUTORSHIPS.—At the beginning of session 1910-11 a gift from Dr. James Douglas, of New York, led to the establishment of a system by which first year students were tutored by men selected from the senior years. The complete success of the work led to the extension of the system to include the more difficult classes of the second year. The instruction is given out of class hours and as each tutor gives his whole attention to not more than five students in a period, the result is that of individual teaching.

REGULATIONS.

N.B.—Students taking a regular course are subject to all rules and Regulations immediately upon publication, unless otherwise specified.

1. REGISTRATION.—All students are required to register and pay the registration, athletic, hospital and class fees within three days of the opening of the session. A student who fails to register within this time must pay an additional fee of \$3.00. No student proceeding to a degree will be allowed to register after the tenth day of the session except by special permission of the Faculty, *which permission must be obtained before the opening of session.*

2. ATTENDANCE.—Students are required to attend seven-eighths of class lectures before permission will be given to write on examinations, and seven-eighths of laboratory hours before laboratory work will be certified. Exemption from this rule can be obtained only on application to the Faculty.

3. COURSES.—All students must take the subjects required in their courses in conformity with the calendars of their years of attendance. If a student wishes to change his course he must first obtain the permission of the Faculty.

4. SESSIONAL EXAMINATIONS.—Candidates must make application on forms supplied by the Registrar for permission to write on examinations. Fees for the April examinations must be paid to the Registrar not later than April 1st, and for the supplemental examinations not later than August 30th. Sessional examinations are held in all the subjects prescribed in the various courses. Forty per cent. is required in each subject for pass standing. In determining a student's standing at a sessional examination, professors are empowered to take into account his entire class record.

Regular students must take the April examinations in all subjects in which they are registered and in which such examinations are held. Failure in more than four classes, including practical classes in which no written examinations are held, involves the loss of the session. A student failing in not more than four classes is given supplemental examinations in the following September; if he fails in more than two of these examinations he must repeat the whole work of the year except those subjects in which his standing is second division (55 p.c.) or higher. A student shall not enter the third year until he has passed all the examinations of the first year; nor the fourth year until he has passed all the examinations of the second year. In this connection the four sections of Mathematics I count as four classes, the two sections of Physics I as two classes, and all other classes count as one each. Engineering Field Work I is regarded as a second year class and comes under this regulation both in respect to back classes and to admission to the fourth year.

5. CHRISTMAS EXAMINATIONS.—Examinations are held for first year students on the last four days before the Christmas vacation. Any student failing in more than four of these examinations is refused admission in the following spring term, half class fees being returned.

Examinations in all classes of the second year are held during the last week before the Christmas vacation or such time as is necessary. Every second year student must write the examination in each class which he attends. The marks given in these examinations will count 25 per cent. of the total for the year.

Examinations, which are duly announced, are held in certain subjects of other years. The marks for these examinations may amount to as much as 25 per cent. of the total for the year.

The Christmas examination in all subjects in which the instruction terminates in December are final examinations and no other papers will be set in these subjects until the following September.

Christmas examinations are limited to two hours each.

6. PRACTICAL WORK.—Students are required to take the practical courses given in the calendar unless they have followed similar courses in other educational institutions, but instructors may, at their discretion, modify the work in the case of students who have had experience in the field, in engineering works, etc. Such students may be set immediately at more advanced work than that required of those who have not had such experience.

7. EXCURSIONS.—The excursions are compulsory for all students where specified under the various classes.

8. VACATION WORK.—Before applying for a degree a candidate is required to submit certificates of having had at least six months' employment of a nature that in the opinion of the Departments concerned shall have given him suitable experience in the practice of his profession.

9. GRADUATION WITH HONOURS. — Honours standing will be given to any student who graduates with an average of seventy-two per cent. or upwards upon the whole of the fourth year work in his course. Credit for Honour standing will be given on the diploma and in the list of graduates a mark of distinction will be placed with the names of those graduating with Honour standing.

10. EXTRA-MURAL STUDENTS.—Students who are not able to attend may register in the classes of Junior English, Junior and Senior Chemistry, Elementary Mineralogy and Geology, as extra-mural students of the Arts Faculty (see Arts Calendar). Tutors are appointed to assist them by correspondence. These are the only classes that may be taken extra-murally for the courses in Applied Science.

11. FEES.—Laboratory fees must be paid before students begin work in the laboratories. All fees are payable to the University Treasurer. Graduation and Spring examination fees must be paid before April 1st; supplemental examination fees before August 30th. The graduation fee is returned to unsuccessful candidates.

Registration, class, athletic, hospital, and Engineering Society fees are payable within the first three days of session. After that time an extra fee of \$3 is charged. If permission is granted by the Treasurer to pay fees in two parts a further fee of \$5 will be charged in addition to the \$3.

Registration for Students of Faculty of Applied Science.....	\$10 00
Engineering Society	2 50
Athletics	3 00
Hospital	3 00
Deposit to cover breakages in laboratory.....	5 00

Class Fees:

First year	75 00
Second year	85 00
Third and Fourth years	95 00

Extra fee for students registering after the first three days of session

Change of classes after registration.....	2 00
Certificate of Standing	1 00
Examination Fee, April, September, or Special.....	10 00

FULL FEES FOR A COURSE

First Year—

If paid in full by October 10th.....	98 50
If paid in instalments:	
1st payment, on or before October 10th.....	63 50
2nd payment, on or before Feb. 1st.....	43 00

Second Year—

If paid in full by October 10th.....	108 50
If paid in instalments:	
1st Payment, on or before October 10th.....	58 50
2nd payment, on or before Feb. 1st	58 00

Third and Fourth Years—

If paid in full by October 10th.....	118 50
If paid in instalments:	
1st payment, on or before October 10th.....	63.50
2nd payment, on or before Feb. 1st	63 00

FEES FOR SINGLE CLASSES

(These are not additional to the sessional fees.)

Any course of lectures	\$ 12 00
Drawing, One Course, per Session	12 00
Surveying, One Course, per Session	12 00
Assaying Laboratory, per Session	5 00
Chemical Laboratory, per Session	15 00
Petrographical Laboratory, per Session	5 00
Mechanical, Electrical or General Engineering Laboratory, per Session	15 00

GRADUATION AND OTHER FEES

Extra fee for degree in absentia.....	\$ 10 00
Graduation B.Sc.	20 00
“ M.Sc.	20 00
“ D.Sc.	50 00
Admission <i>ad eundem statum</i>	10 00

12. DEPOSITS.—For covering expenses of breakages, etc., a student must deposit \$5 with the Treasurer. If at any time the amount of breakages, etc., exceeds \$3, an additional deposit of \$5 must be made. Charges will be made for the use of platinum, and specially expensive chemicals and apparatus. All money to the credit of the depositors will be returned at the end of the session on presentation of the deposit receipt properly certified.

DEGREES.

1. The degree of B.Sc. will be given on the satisfactory completion of a four years' course in any one of the following departments:—

- A. Mining and Metallurgical Engineering.
- B. Analytical and Applied Chemistry.
- C. Mineralogy and Geology.
- D. Chemical and Metallurgical Engineering.
- E. Civil Engineering.
- F. Mechanical Engineering.
- G. Electrical Engineering.
- H. Physics.

A graduate in any course who desires to take the degree of B.Sc. in any other course, or a student desiring to change from one

course to another, shall take all the classes which he has not already passed, in that course, or, by examination satisfy the Department in charge of those classes as to his knowledge of the subjects involved.

2. The degrees of B.A. and B.Sc. will be given on the satisfactory completion of a six years' course in Arts and Science according to the description on page 39.*

A candidate for graduation must have completed either a four or a six years' course and have passed all the required examinations.

3. The degree of Master of Science (M.Sc.) is granted to candidates who have graduated as B.Sc. and thereafter:—

a. Have practised their profession for at least two years (one year of which must have been responsible engineering or scientific work); or

b. Have spent at least one session in attendance at the Faculty of Applied Science after graduation as B.Sc.

In either case the candidate must have carried on research work, the results of which must be submitted, on or before March 30th, in the form of a thesis satisfactory to the Faculty. The literary as well as the scientific quality of the thesis is considered.

In addition to this, an examination is required, on subjects kindred to that treated in the thesis. This examination must be written in April. The candidate must give notice of his intention to proceed to the degree at least six months before he presents himself for examination, and must at the same time submit for approval the subject of his research. The subjects for examination will then be assigned by the Faculty.

4. The degree of Doctor of Science (D.Sc.) is granted to candidates who have graduated as M.Sc. or have otherwise satisfied the Faculty of their ability to proceed, and have thereafter fulfilled the conditions which here follow.

*The degree of M.A. and B.Sc. may be obtained in seven years in properly selected courses. See page 43.

The degree is not granted until after at least three years from the time of graduation as M.Sc. unless one session is devoted to research in an approved University or School of Engineering or Applied Science; in which case the degree may be granted at the end of two years from the time of graduation as M.Sc.

The candidate must submit a thesis embodying the results of his original and independent research in some subject of importance to science. The literary as well as the scientific quality of the thesis is taken into account in judging the candidate's fitness to proceed to the examination.

The candidate must make application in writing to the Registrar of the University at least two years before he proposes to present himself for examination, and must at the same time submit for approval the subject of his research. The subjects of the examination, which will be cognate to that of the thesis, will then be assigned by the Faculty, and will include a reading knowledge of either Scientific French or German.

5. B.A. and M.A. courses in Chemistry, Assaying, Mineralogy, Geology, etc. (See Calendar of the Arts Faculty).

DOMINION LAND SURVEYORS.

The Degree in Mining or in Civil Engineering of Queen's University, Kingston, is equivalent to the "diploma as Civil Engineer" mentioned in Clause III of the Dominion Lands Act; so that a candidate for D.L.S. having that degree from Queen's University is entitled to examination after one year's service with a D.L.S.

ONTARIO LAND SURVEYORS.

The Ontario Land Surveyors' Act, I Geo. V., C. 41, S. 28.
"The privilege of a shortened term of apprenticeship shall be accorded to any graduate of . . . the School of Mining, Kingston,* in Civil Engineering, or in Mining Engineering, and such person shall not be required to pass the preliminary examination herein-

*Now the Faculty of Applied Science of Queen's University.

before required for admission to apprenticeship with a land surveyor, but shall only be bound to serve under articles with a practising land surveyor, duly filed as required by section 32 of this act, during twelve successive months of actual practice, after which, on complying with all the other requirements, he may undergo the examination prescribed by this Act."

COURSES.

- A. Mining and Metallurgical Engineering.
- B. Analytical and Applied Chemistry.
- C. Mineralogy and Geology.
- D. Chemical and Metallurgical Engineering.
- E. Civil Engineering.
- F. Mechanical Engineering.
- G. Electrical Engineering.
- H. Physics.

A.—MINING AND METALLURGICAL ENGINEERING.

This course is necessarily a very broad one, so that it may give a foundation for whatever branch of these professions a graduate may follow. Experience has shown that graduates do not usually follow any narrow differentiation which they make during their course, but are governed by many other factors in the practice of Mining and Metallurgical Engineering. These factors are often out of their control, and the wisest plan in a four years' course appears to be, not to specialize, but by a broad training, in the final years, to obtain a suitable introduction to any branch of the work.

There are, however, some well known avenues towards professional work, such as a good training and a manipulative skill in drafting, chemical analysis, and surveying. These subjects are com-

mon, and imperative, to almost any professional position in mining and metallurgy, therefore they are perfected as far as is possible while at college.

At the present time there are no summer classes, or summer field work in mining or metallurgy, excepting the Engineering Field work of the second or third years, which work takes place early in May. Under these conditions the student can, usually, obtain practical and remunerative work, during four or five months each summer. This work, if in connection with Mining, Metallurgy or Surveying is considered to be more useful as a training than practical work under academic supervision.

The degree of B.Sc. is given upon the completion of this course, and evidence of at least six months spent at work in connection with mines, metallurgical works, surveying or geology.

FIRST YEAR.

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page
Junior English	3		54
Public Speaking		1	54
Mathematics I.	2		57
Mathematics II	3		57
Mathematics III	2		58
Astronomy I	1		58
Descriptive Geometry	1	2	103
Physics I.	3	2	59
General Chemistry I	2	3	62
Drawing I		5	103
Physical Drill		2	105

SECOND YEAR.

Same as Course C.

Mathematics IV	2(a)		58
Mathematics V	2(a), 3(b)		58
Astronomy II	2(a), 3(b)		58
Physics II	3	2	60
Analytical Chemistry I	1	2	63
Analytical Chemistry II		2	63
Analytical Chemistry III		3	63
General Chemistry II	1		63
Mineralogy I	1	2	74
Geology I	2		68
Drawing II		3	103
Surveying I	1	3	92

THIRD YEAR.

For Session 1919-20 only

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page
Analytical Chemistry IV		5	63
Mineralogy IV		4	75
Geology II	1(a) 2(b) ..		69
Geology III	2	2	70
Geology IV	2(a)		70
Geology V	1(b)		70
Mining I	2		77
Ore Dressing	2		78
Metallurgy I	2		82
Fire Assaying		4(b)	84
Thermodynamics I	2(a)		101
General Engineering I	2		86
General Engineering III		2	87
Electrical Engineering I	1(a) 2(b) ..		95
Surveying VII	1	2	94
Mechanical Engineering VII	1		100
Economics I	1		56

FOURTH YEAR.

For Sessions 1919-20 and 1920-21

Industrial Chemistry II	1		66
Mineralogy VI	1		76
Geology VIII	2		72
Mining II	3		78
Milling		11	80
Metallurgy, Mining and Mill Designing or (Mining and Metallurgy IV)		5	79
Metallurgy II	4		82
General Engineering II	2		86
Hydraulic Engineering I	2		89
Mechanical Engineering IV	2		99
Economics II	1		57
Summer Essay			79

NOTE—The letters (a) and (b) denote first and second terms, respectively.

B.—ANALYTICAL AND APPLIED CHEMISTRY.

This course is intended to prepare candidates to enter upon the practice of chemical analysis, to fit them for positions in the laboratories of metallurgical, mining, food and other manufacturing works; also for the profession of public analyst, and for other positions where a thorough knowledge of chemical analysis and mineralogy is required. The first two years are devoted to those subjects that serve as an introduction to the more specialized work of the last two years. The advanced work of the fourth year deals mainly with practice in analysis of the products of those industries that are being

developed in Canada at the present time, together with a small research problem to be undertaken under the supervision of one of the professors.

FIRST YEAR.

Same as first year *Course A*.

SECOND YEAR.

Same as *Course D*.

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page
Mathematics IV	2(a)		58
Mathematics V	2(a) 3(b) ..		58
Physics II	3	2	60
Analytical Chemistry I	1	2	63
Analytical Chemistry II		2	63
Analytical Chemistry III		3	63
Analytical Chemistry IV		4	63
General Chemistry II	1		63
Mineralogy I	1	2	74
General Engineering I	2		86
Drawing II		3	103
Surveying I	1	3	92

THIRD YEAR.

For Session 1919-20 only

Analytical Chemistry V		5	64
Analytical Chemistry VI		5	64
Organic Chemistry II	2	2	64
Physical Chemistry I	2(a) 1(b) ..	2(a) 3(b) ..	65
Industrial Chemistry I	2	4	66
Mineralogy III	2(b)		75
Mineralogy IV		5	75
Geology I	2		68
Metallurgy I	2		82
Economics I	1		56

FOURTH YEAR.

For Sessions 1919-20 and 1920-21

General Chemistry III	1	2	63
Analytical Chemistry VIII		4	64
Physical Chemistry II	2(a) 1(b) ..	2(a) 3(b) ..	65
Organic Chemistry III	1	2	65
Organic Chemistry IV		4	65
Mineralogy VI	1		76
Bacteriology		2	77
Fire Assaying		4(b)	84
Economics II	1		57
Advanced Work—An option is allowed between A and B.			
A.—General Chemistry IV		14	63
B.—Organic Chemistry V		14	65

NOTE—The letters (a) and (b) denote first and second terms, respectively.

C.—MINERALOGY AND GEOLOGY.

This course is designed to meet the requirements of students who desire a theoretical and practical knowledge of the constitution and history of the Earth. It furnishes a foundation for the professions of mineralogist, geological surveyor, mining and consulting geologist, and is useful for those who will in any way be connected with the discovery or the development of the natural resources of the country. It forms a good preliminary course for the mining engineer who wishes to understand thoroughly the groundwork of his profession. Since a knowledge of chemistry is essential for proper comprehension of many mineralogical and geological phenomena, considerable stress is laid on this science in the earlier part of the course. The departments of mineralogy and geology are furnished with well equipped laboratories for the physical and chemical examination of minerals, rocks and ores, and also with collections of illustrative material. While field excursions are made during the session, students are advised to spend the summer vacations in practical field work.

FIRST YEAR.

Same as first year *Course A*.

SECOND YEAR.

Same as *Course A*.

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page
Mathematics IV	2(a) .....	.....	58
Mathematics V	2(a) 3(b) ..	.....	58
Astronomy II	2(a) 3(b) ..	.....	58
Physics II	3	2	60
Analytical Chemistry I	1	2	63
Analytical Chemistry II .....	.....	2	63
Analytical Chemistry III .....	.....	3	63
General Chemistry II	1 .....	.....	63
Mineralogy I	1	2	74
Geology I	2 .....	.....	68
Drawing II .....	.....	3	103
Surveying I	1	3	92

THIRD YEAR.

For Session 1919-20 only

Elementary German	3 .....	.....	55
Analytical Chemistry V .....	.....	5	64
Analytical Chemistry VI .....	.....	5	64

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page
Physical Chemistry I	2(a) 1(b) ..	2(a) 3(b) ..	65
Mineralogy IV	1	5	75
Mineralogy VI	1(a), 2(b) ..	.....	76
Geology II	2	2	69
Geology III	2(a) .....	.....	70
Geology IV	1(b) .....	.....	70
Geology V	2 .....	.....	70
Ore Dressing	1 .....	.....	78
Economics I .....	.....	.....	56

FOURTH YEAR.

For Sessions 1919-20 and 1920-21

Geology VI	2 .....	.....	71
Geology VII	1	2	71
Geology VIII	2 .....	.....	72
Geology X .....	.....	2	73
Mining I	2 .....	.....	77
Metallurgy II	4 .....	.....	82
Surveying VII	1	2	94
Economics II	1 .....	.....	57
Advanced Analysis of Rocks with thesis. ....	.....	20 .....	.....

NOTE—The letters (a) and (b) denote first and second terms, respectively.

D.—CHEMICAL AND METALLURGICAL ENGINEERING.

In the construction and operation of chemical works and also in metallurgical enterprises in which the processes are of the more complicated kind there are often required the services of a man who combines a thorough knowledge of chemistry with the education of an engineer; but the chemical engineer must have at his command not merely the elements of general engineering, but also a competent knowledge of those materials of construction and the special kinds of plants and processes which are in use in the works mentioned. The course in chemical and metallurgical engineering covers four years of study, the first two of which do not differ materially from those of the courses in Analytical and Applied Chemistry, or Mining and Metallurgy. Specialization begins in the third year, the time being divided between Chemistry, and Civil and Mechanical Engineering. This is continued in the fourth year, which enables a student to specialize in advanced work in Chemistry, Chemical Engineering, Metallurgy, and Electro-Chemistry.

Visits are paid to local and to at least one outside chemical works, at which attendance is required.

FIRST YEAR.

Same as first year *Course A*.

SECOND YEAR.

Same as *Course B*.

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page
Mathematics IV	2(a)		58
Mathematics V	2(a), 3(b) ..		58
Physics II	3	2	60
Analytical Chemistry I	1	2	63
Analytical Chemistry II		2	63
Analytical Chemistry III		3	63
Analytical Chemistry IV		4	63
General Chemistry II	1		63
Mineralogy I	1	2	74
General Engineering I	2		86
Drawing II		3	103
Surveying I	1	3	92

THIRD YEAR.

For Session 1919-20 only

Analytical Chemistry V		5	64
Physical Chemistry I	2(a), 1(b) ..	2(a) 3(b) ..	65
Industrial Chemistry I	2		66
Thermodynamics I	2(a)		101
Thermodynamics II	1(b)		101
General Engineering II	2		86
General Engineering III		2	87
Electrical Engineering I	1(a) 2(b) ..		95
Mechanical Engineering I	4(a)		98
Mechanical Engineering III		3	99
Economics I	1		56
Shopwork		3	104

Option Chemical Engineering.

Organic Chemistry I	1	2	64
Industrial Chemistry I Lab.		4	66

Option Metallurgical Engineering.

Ore Dressing	2		78
Metallurgy I	2		82
Fire Assaying		4(b)	84

FOURTH YEAR.

For Sessions 1919-20 and 1920-21

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page
Physical Chemistry II	2(a) 1(b) ..	2(a) 3(b) ..	65
Structural Engineering I	1	3	88
Mechanical Engineering IV	2 .....	.....	99
Economics II	1 .....	.....	57

Option Chemical Engineering.

Analytical Chemistry VI .....	.....	5	64
General Chemistry III	1	2	63
Chemical Engineering I	3	4	84
Chemical Engineering II .....	.....	8(a) 4(b) ..	84
Metallurgy I	2 .....	.....	82
Ore Dressing	2 .....	.....	78
Fire Assaying .....	.....	4(b)	84

Option Metallurgical Engineering.

Organic Chemistry I	1	2	64
Industrial Chemistry I, Lab. ....	.....	4	66
Metallurgy II	4 .....	.....	82
Metallurgy III	1(b) .....	.....	83
Metallurgical Lab. ....	.....	3	83
Milling .....	.....	11	80

NOTE—The letters (a) and (b) denote first and second terms, respectively.

E.—CIVIL ENGINEERING.

In this course the two main divisions of Civil Engineering, namely Surveying and Draughting, on the one hand, and Structural Design and Construction, on the other, receive full consideration. During the earlier years of the course a sound training along engineering lines is given in Mathematics, Physics, Mechanics and other allied subjects, which are essential to the proper education of an engineer. The student is also made familiar with the use of the various instruments, and by many hours of practical work in the field and draughting room, becomes skilled in the ordinary operations of Surveying. During the same period the foundation work for structural design is laid by courses of lectures in materials of construction, as well as by demonstrations and practical work in the testing laboratories. The second year is closed by two weeks of

Engineering Field Work, whereby the student is brought into contact with the problems of railway location, and hydrographic surveying. During the final years more highly specialized instruction and training are given along the lines of the two main divisions, with particular regard to the economic conditions of modern construction. At frequent intervals excursions are undertaken to the quarries, cement works, brick kilns, bridges, railway structures, canals and graving docks, which are to be found within easy distance of Kingston.

FIRST YEAR.

Same as first year *Course A*.

SECOND YEAR.

Same as *Courses F, G*.

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page
Mathematics IV	2(a)		58
Mathematics V	2(a) 3(b)		58
Astronomy II	2(a) 3(b)		58
Physics II	3	2	60
Physics III		1	61
Analytical Chemistry VII	1	2	64
General Engineering I	2		86
Mechanical Engineering IX	1	2	101
Drawing III		3(a) 6(b)	103
Surveying II	2		92
Surveying III		6(a) 3(b)	93
Shopwork I		3	104

THIRD YEAR.

For Session 1919-20 only

Mineralogy V	1(a)		76
Metallurgy I	2		82
Thermodynamics I	2(a)		101
Thermodynamics II	1(b)		101
General Engineering II	2		86
General Engineering III		2	87
General Engineering VI	1	3(b)	87
Engineering Field Work II		3(a)	94
Electrical Engineering I	1(a) 2(b)		95
Railway Engineering I	2	2	90
Hydraulic Engineering I	2		89
Structural Engineering I	1	3	88
Structural Engineering III	1	3	88
Municipal Engineering I	1		91
Mechanical Engineering VII	1		100
Surveying IV	1	2	93
Surveying V	½	2½	93
Economics I	1		56

FOURTH YEAR.

For Sessions 1919-20 and 1920-21

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page
Industrial Chemistry II	1		66
Geology IX	1		72
General Engineering IV		2	87
General Engineering V	1		87
Railway Engineering II	1	2	90
Railway Engineering III	2	2	90
Municipal Engineering II, III	2		91
Highway Engineering	2(a)	1(b)	91
Hydraulic Engineering II	1		89
Structural Engineering II	1	3	88
Structural Engineering IV	1	6	89
Mechanical Engineering IV	2		99
Economics II	1		57

NOTE—The letters (a) and (b) denote first and second terms, respectively.

F.—MECHANICAL ENGINEERING.

The profession of Mechanical Engineering embraces the design, manufacture and operation of all classes of machinery, of power plants and manufacturing plants, as well as the executive management of industries. A four years course therefore must be broad enough to give the student a thorough training in the fundamental principles, and any subdivisions intended to train a student for any one of the many specialties only, seem unwise, and are impracticable on account of the lack of time.

The first two years are devoted to the study of the fundamental subjects of Mathematics, Physics, Chemistry, and Mechanics, including experimental work in the various laboratories. Special attention is given to the subject of strength of materials, with practice in testing during the second and third years. The study of the steam engine, and other forms of heat-engines, includes courses in Thermodynamics, Valve Gears, Governors and the Balancing of Engines. Instruction is given in Mechanism, Machine Design, Shop Work, and the fundamental principles of Electrical Engineering. Instruction in drawing extends over the four years, and gives a thorough drill in modern drafting room practice. In the more advanced courses of the fourth year the student is taught how to apply

the general principles to the design and operation of special machinery, steam and gas engines, steam boilers and gas producers, and complete power plants; *i.e.*, each student is allowed to specialize as far as is practicable. The instruction in the laboratories is intended not only to familiarize the student with standard methods of testing, but also to teach him how to attack original problems.

The fourth year students are kept in touch with the local manufacturing concerns in order to familiarize them with modern power plant and shop practice.

FIRST YEAR.

Same as first year *Course A*.

SECOND YEAR.

Same as *Courses E, G*.

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page
Mathematics IV	2(a)		58
Mathematics V	2(a)	3(b)	58
Astronomy II	2(a)	3(b)	58
Physics II	3		60
Physics III		1	61
Analytical Chemistry VII	1	2	64
General Engineering I	2		86
Mechanical Engineering IX	1		101
Drawing III		3(a)	103
Surveying II	2		92
Surveying III		6(a)	93
Shopwork I		3	104

THIRD YEAR.

For Session 1919-20 only

Industrial Chemistry II	1		66
Metallurgy I	2		82
Thermodynamics I	2(a)		101
Thermodynamics II	1(b)		101
Thermodynamics V	1	2	102
General Engineering II	2		86
General Engineering III		2	87
Electrical Engineering I	1(a)	2(b)	95
Hydraulic Engineering I	2		89
Structural Engineering I	1		88
Mechanical Engineering I	4(a)		98
Mechanical Engineering II	4(b)		99
Mechanical Engineering III		8	99
Mechanical Engineering IV	2		99
Economics I	1		56
Shopwork		3	104

FOURTH YEAR.

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page
Thermodynamics III	2	3(a).....	101
Thermodynamics IV		6	102
Electrical Engineering VII		2	96
Mechanical Engineering V	2	16.....	99
Mechanical Engineering VI	2(a) 1(b) ..		100
Mechanical Engineering VIII		3	100
Economics II	1		57
Mechanical Engineering X	1		101
Mechanical Engineering XI	2	0	101

G.—ELECTRICAL ENGINEERING.

The instruction in the first two years of the course in Electrical Engineering provides for a thorough training of the student in the fundamental subjects of Mathematics, Physics, Chemistry and Mechanics, including suitable work in the various laboratories. Part of the time is devoted to elementary drawing and shop work. In the third year the work consists of an introduction to the general principles underlying all electrical work together with elementary laboratory work. Considerable time is devoted to the study of Thermodynamics and advanced mechanical drawing. The fourth year is devoted to the study of the action and design of all kinds of electrical apparatus, the design and operation of central stations, electric lighting, electric railways and power transmission.

An important part of the work consists in the working out of problems such as are frequently met in practical work. In this way the student is trained in the application of theory to the solution of practical problems.

Arrangements are made for occasional visits to electrical works.

The whole course is designed to give the student a thorough understanding of the general principles which constitute the basis of all electrical work, together with a knowledge of how these principles are applied in practice. No effort is made to give that intimate knowledge of practical details which experience alone can supply.

FIRST YEAR.

Same as first year *Course A*.

SECOND YEAR.

Same as *Courses E, F*.

	Lect. Hrs. per week.	Lab. Hrs per week.	Page
Mathematics IV	2(a)		58
Mathematics V	2(a) 3(b)		58
Astronomy II	2(a) 3(b)		58
Physics II	3	2	60
Physics III		1	61
Analytical Chemistry VII	1	2	64
General Engineering I	2		86
Mechanical Engineering IX	1	2	101
Drawing III		3(a) 6(b)	103
Surveying II	2		92
Surveying III		6(a) 3(b)	93
Shopwork I		3	104

THIRD YEAR.

For Session 1919-20 only

Physics IV	1	4	61
Metallurgy I	2		82
Thermodynamics I	2(a)		101
Thermodynamics II	1(b)		101
General Engineering II	2		86
General Engineering III		2	87
Mechanical Engineering I	4(a)		98
Mechanical Engineering II	4(b)		99
Electrical Engineering II	4	3	95
Electrical Engineering III	2	2	96
Electrical Engineering IV		5	96
Economics I	1		56
Shopwork (taken during vacation)			104

FOURTH YEAR.

For Sessions 1919-20 and 1920-21

Metallurgy III	1(b)		83
Thermodynamics III	2	4(a)	101
Electrical Engineering V	3	3	96
Electrical Engineering VI	2(a) 1(b)	3	96
Electrical Engineering VIII	1(b)	2(b)	96
Hydraulic Engineering I	2		89
Mechanical Engineering IV	2		99
Mechanical Engineering VIII		3(a)	100
Mechanical Engineering X	1		101
Economics II	1		57

In addition to the above one of the following subjects must be selected:

Electrical Engineering IX	2(a) 1(b)	3	97
Electrical Engineering X	1(a) 2(b)	3	97
Electrical Engineering XI	2(a) 1(b)	3	97

NOTE—The letters (a) and (b) denote first and second terms, respectively.

H.—PHYSICS.

This course is designed to fit men for positions as physicists in research laboratories.

The importance of a thorough grounding in the fundamental subjects of Physics, Mathematics, and Chemistry, cannot be over-emphasized, so these subjects form the major part of the course. The engineer's point of view is secured from the classes of the Practical Science Faculty, while the breadth of view, necessary for a research worker, is gained from the advanced theoretical classes in the major subjects of the course. Students contemplating taking this course are urged to acquire a reading knowledge of French and German as early in the course as possible.

FIRST YEAR

Same as first year *Course A*.

SECOND YEAR

Same as second year in any course.

Summer work 12 weeks in Commercial Shop (see page 91).

THIRD YEAR

Economics I	1	.....	56	
Mathematics:				
Analytical Geometry and Calculus	2	.....	
Algebra	1	.....	
Physics:				
Elementary Theoretical Mechanics	1	.....	
Thermodynamics	1	.....	
Electricity and Magnetism (IV)	1	.....	
Laboratory			4	
Chemistry: Qualitative Analysis	1	.....	4	63
French or German	5	.....	

See Arts
Calendar

Summer work of research character to be arranged by Department of Physics.

FOURTH YEAR

Economics II	1	.....	57	
Mathematics:				
Analytical Solid Geometry	1	.....	
Advanced Calculus	1	.....	
Differential Equations	1	.....	
Physics:				
Mechanics of Rigid and Elastic Bodies... ..	1	.....	
Kinetic Theory of Gases	1	.....	
Electricity, Electrodynamics and Con- duction through Gases	1	.....	
Laboratory			9	
Chemistry: Physical Chemistry	1	.....	3	65
German or French	5	.....	

The modern language of the Fourth Year is the one not selected in the Third Year.

COURSE FOR B.A. LEADING TO THE DEGREES OF B.A. AND B.Sc. IN SIX YEARS.

Students taking these courses are required to have Arts Matriculation and to register the first two years in Arts alone and pay the class and registration fess in Arts, to register the second two years in both Arts and Science, to pay both registration fees and the Science class fees and to register the last two years in Science only, paying the registration and class fees. Arts classes are subject to the regulations in the Arts Calendar, and Science classes to the regulations in the Science Calendar.

The courses for B.A. and B.Sc. must be taken as laid down in the following scheme. The regulations regarding back classes on page 30 will be applied on these courses.

(The Arts Classes are italicized).

FIRST YEAR.

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page
<i>Junior English</i>	4		54
<i>Junior Latin</i>			
<i>Junior Greek</i>			
<i>Junior French</i>			
<i>Junior German</i>			
<i>Junior Spanish</i>			
Any two	10		See Arts Calendar
Mathematics I	2		57
Descriptive Geometry	2		103
Drawing I ..	1	4	103

SECOND YEAR.

<i>Senior English</i> ...	4		
<i>Senior Latin</i>			
<i>Senior Greek</i>			
<i>Senior French</i>			
<i>Senior German</i>			
Any one	5		See Arts Calendar
Economics			
Politics			
Any one	3		
<i>Animal Biology</i>			
<i>Colonial History</i>			
Any one	3		
Mathematics II	3		57
Mathematics III	2		58
Astronomy I	1		58

THIRD YEAR.

<i>Senior Philosophy</i>	}	Any one	3	See Arts Calendar
<i>Junior Philosophy</i>				
Physics I			4	..... 2 59
General Chemistry I			2	..... 3 62
<i>European History</i>	}	Any one	3	See Arts Calendar
<i>English History</i>				
Drawing II			1	..... 103
Surveying I			2	..... 92
Physical Training			3	..... 105

Fourth, Fifth and Sixth Years are the same as Second, Third and Fourth Years of any of the courses in the Faculty of Applied Science with the exception of Drawing II, which appears in the Third Year of the course outlined above.

If a student on one of these courses wishes to specialize in one or more of the Arts subjects, he may do so in the honour classes.

Attention is called to the fact that by proper selection of classes an entire Arts course leading to the degree M.A. and a B.Sc. course in the Faculty of Applied Science, can be completed in seven years.

SUBJECTS OF STUDY.

ENGLISH LANGUAGE AND LITERATURE

PROFESSOR—James Cappon, M.A.

ASSISTANT PROFESSOR—John F. Macdonald, M.A.

ASSISTANT PROFESSOR—W. D. Taylor, M.A.

JUNIOR CLASS

This class will meet three times a week at 8 a.m.

1. PRACTICAL COURSE IN RHETORIC AND COMPOSITION.

- (a) General Theory and illustrations.
- (b) Exercises on the above, with essays.

8 a.m. Professor Macdonald.

Text-book:—Linn, *Essentials of Composition* (Scribners).

2. STUDY OF REPRESENTATIVE PROSE AUTHORS. Addison, Jane Austen, Carlyle. *The Spectator* Vol. I (Everyman); Jane Austen's *Pride and Prejudice* (Everyman); Carlyle's *Past and Present* (Everyman).

First Term—8 a.m. Professor Taylor.

3. POETICAL LITERATURE. Shakespeare, *King Henry IV, Part I*. English Lyrical Poetry from 1600 to 1900; Palgrave's *Golden Treasury*, (World's Classics, No. 133).

Second Term—8 a.m. Professor Taylor.

4. PUBLIC SPEAKING. At the beginning of the course a number of lectures will be given on the method of breathing, voice production, and the organization of a public speech, but the work of the class will consist chiefly in the practical work of speech delivery.

8 a.m. Professor Fallis.

GERMAN

PROFESSOR—J. Macgillivray, B.A., Ph.D.

ASSISTANT PROFESSOR—Thure Hedman, Ph.B.

PREPARATORY CLASS

This class is intended to meet the needs of students who, owing to inadequate conditions in most of the secondary schools, enter the University with little or no knowledge of German. It is taken by students who need it to complete Matriculation, or to pursue the study of a course of which German forms an essential part, or in which text-books or works of reference in German are prescribed or recommended. The requirements correspond generally to those for Junior Matriculation. The work consists of:

1. PRONUNCIATION.

2. ESSENTIALS OF GERMAN GRAMMAR.

3. READING, TRANSLATION, AND STUDY OF SIMPLE GERMAN LITERATURE.

4. ORAL AND WRITTEN COMPOSITION. These exercises are based on the texts and consist of questions and answers in German, translation of sentences from English into German, and short compositions written in German.

Text-books:—

Arnold Spanhoofd, *Elementarbuch der deutschen Sprache* (Heath).

Dippold, *Scientific German Reader*—selections (Ginn).

Volkman-Leander, *Träumereien*—selections (Ginn).

This class will meet three times a week on days and at hours to be arranged to suit.

For information regarding Junior and Senior German, see Arts Calendar.

FRENCH

PREPARATORY FRENCH

LECTURER—W. M. Conacher, B.A.

The class meets on Monday, Tuesday, Wednesday and Friday at 2 p.m. and the work, which leads up to *Junior Matriculation*, includes study of Grammar (Fraser and Squair, High School French Grammar) and one of the text-books of the Junior French Class, together with elements of pronunciation, reading and dictation.

Note.—For Junior Class (daily, 9 or 11) and Senior Class (daily, 10 or 12) see Arts Calendar.

SPANISH.

ASSISTANT PROFESSOR—J. H. Brovedani, Docteur ès Lettres.

1. *Voluntary Class.*

There will be conducted, for Science students only, a voluntary class in Spanish. The object of the course is to give students a practical acquaintance with the spoken language. There will be two lectures a week arranged by consultation at the beginning of the session. The complete course is designed to cover two years. The first year will be devoted almost entirely to oral work, in the second special attention will be given to the technical requirements of commerce and science, and to correspondence. No previous knowledge of the language is necessary.

2. Students who choose Spanish as a subject for the combined course leading to the degree of B.A. and B.Sc. must take it as prescribed in the Calendar of the Faculty of Arts.

ECONOMICS.

PROFESSOR—O. D. SKELTON, M.A., Ph.D.

LECTURER—H. Michell, M.A.

ECONOMICS I.

ECONOMICS OF BUSINESS.

This course will include an investigation of the promotion, organization, and operation of modern business enterprises, together with a detailed study of corporate securities and the investment market. Attention will also be paid

to modern methods of cost accounting, methods of efficiency, etc. A summary will be given, with practical examples, of the chief rules of Commercial Law affecting common business transactions. For third year students.

Lecture—Thurs. 8-9. Professor Skelton.

ECONOMICS II.

This course consists of lectures on Economics, and is designed to cover the more important principles, more particularly in relation to Canadian conditions. Labour problems, the organization of industry, the business cycle, money and banking are reviewed in detail.

Lecture—Mon. 4-5. Mr. Michell.

Text-book—Clay, *Economics for the General Reader.*

MATHEMATICS.

PROFESSOR—J. Matheson, M.A.

PROFESSOR—D. Buchanan, M.A., Ph.D.

ASSISTANT PROFESSOR—D. S. Ellis, M.A., B.Sc., D.L.S., O.L.S.

ASSISTANT PROFESSOR—C. F. Gummer, M.A.

LECTURER—D. M. Jemmett, M.A., B.Sc.

MATHEMATICS I.

PLANE TRIGONOMETRY, covering the essentials of the subject.

Tues. and Thurs. 9-10. Mr. Jemmett.

MATHEMATICS II

ALGEBRA, including expansion into series, fractions, indices and surds, proportion, graphing of functions, quadratics, permutations and combinations, binomial theorem, undetermined coefficients, summation of series, continued fractions, logarithms, exponentials.

Mon., Wed. and Fri. 9-10. Mr. Jemmett.

MATHEMATICS III

COORDINATE GEOMETRY of two dimensions, including the straight line, circle, ellipse, parabola, hyperbola, and catenary, with practical applications to engineering practice. Introduction to co-ordinate geometry of three dimensions.

Mon. and Wed. 11-12. Mr. Jemmett.

MATHEMATICS IV

SOLID GEOMETRY, covering the properties of the principal solid figures, methods and formulae for areas and volumes, including Pappus' theorems, etc. Particular attention is given to practical applications of geometric principles.

Tues. and Thurs. 8-9 (a). Professor Gummer.

MATHEMATICS V

DIFFERENTIAL AND INTEGRAL CALCULUS, with application to curves and curve tracing, measurement of the lengths of curves, the areas of surfaces, and the volumes of solids; mass centre; centre and moment of inertia, radius of gyration; mechanical quadrature; differential equations, as applied to elementary mechanics.

Mon. and Tues. 10-11; Thurs. 8-9 (b).

Professor Matheson.

ASTRONOMY I

ASTRONOMY, including the fundamental principles of the subject, such as the systems of coordinates, refraction, dip of the horizon, parallax, aberration, the shape and motions of the earth, the motions of the moon, precession and nutation, gravitation, planetary motion, time.

Fri. 11-12. Professor Buchanan.

ASTRONOMY II

SPHERICAL TRIGONOMETRY and its application to geodesy and astronomy; least squares, the use of the ephemeris.

Wed. and Thurs. 10-11, Tues. 8-9 (b).

Professor Buchanan.

PHYSICS.

PROFESSOR—Arthur L. Clark, Ph.D.

ASSOCIATE PROFESSOR—W. C. Baker, M.A.

ASSISTANT PROFESSOR—J. K. Robertson, M.A.

ASSISTANT PROFESSOR—E. Flammer, B.Sc., Ph.D.

ASSISTANT—S. C. Morgan, B.Sc.

The work in Physics is carried on in lecture and laboratory courses, which run parallel to each other. In the lecture room the fundamental principles are developed and applied, experimental demonstrations given and many problems solved. In all classes in Physics weekly exercises are required of students. In the laboratory a large number of experiments are performed. These are designed to train the student in manipulation of apparatus and instruments of precision, to teach him to make accurate measurements and to give practice in properly recording, interpreting and reducing experimental data. Opportunity is offered for advanced work in the various parts of the subject in the Arts Honour Courses. See Arts Calendar.

Students who wish to prepare themselves for special work requiring a more extensive knowledge of Physics than is possible from the regular classes of the Science course may have suitable courses planned for them on application to the Professor of Physics. This work may include special reading, attendance at certain lectures, special assistance, and, in cases where the candidate is fitted to undertake it, directed research.

In all the courses in Physics, the work in the laboratories will be counted as a certain percentage of the whole work of the session. In estimating the standing in the laboratory work, both the quantity and quality of the work done will be considered.

PHYSICS I.

This class is required of first year students in all courses and is elementary, no previous knowledge of the subject being necessary. Students in this class have opportunity for assistance by Douglas tutors. (See page 24). The work is divided into three parts, as follows:—

A—MECHANICS.

In this part of the work the foundations of Mechanics are discussed with special emphasis on the establishment of the fundamental principles and relations. The aim is to reduce to exact statement that knowledge of matter and motion that is the common possession of all students. Numerous experiments are shown, not so much to supply new facts as to focus the attention on the quantitative aspect of phenomena already familiar. This is followed by the solution of many numerical problems taken from cases within the experience of the student, emphasizing the relations that have been established in the lectures. In this way the student is led to lay for himself a firm foundation for all later work in Physics, both cultural and technical and for work in Engineering where clear understanding of the principles of Mechanics is all important.

B—ELECTRICITY AND MAGNETISM, SOUND, LIGHT AND HEAT.

This part of the work consists of lectures on Magnetism, Electricity, Wave Motion, Sound, Light, and Heat, which are discussed both mathematically and experimentally.

Text-book—Kimball, *College Physics*.

Lectures in A and B—Tues., Wed. and Thurs. 10-11.

Professors Clark and W. C. Baker.

C—LABORATORY.

Credit for laboratory work is given on both of the written papers of this class.

Laboratory—Sections a, b, Wed. 1-3; c, d, Mon. 1-3; e, f, Thurs. 1-3.

Professors Clark and Baker.

PHYSICS II.

This class is required of all students.

This course of lectures is a continuation of Physics I. Mathematics III is taken at the same time as this class, consequently during the latter part of the year the Calculus is used freely. A general review of the important fundamental principles of Physics occupies the first few weeks. These are then applied to problems dealing with Motion in a Circle, Simple Harmonic Motion, Composition of Simple Harmonic Motions with applications, Moments of Inertia, Rotation, Friction of Belts, Pivots and Bearings, Elasticity in Stretching, Bending, and Twisting, Energy and its Transformations, Ohm's Law, Shunts, Available Voltage, Electrical Energy, Power, Kirchhoff's Laws, Laws of Electrolysis, Electromotive

forces of cells, the Magnetic circuit and Electromagnetic Induction, etc. Throughout the year, weekly exercises are required of the students. These are discussed in class later.

Lectures—Mon., Wed. and Fri. 8-9. Professor Clark.

The laboratory work, which runs parallel with the lectures, is a continuation of the work of the first year.

Laboratory—Courses E, F, G, Mon. 3-5; Courses AC, BD, Sat. 9-11.

Professor Clark.

PHYSICS III.

This class is required of second year students in Courses E, F, and G.

The work of this class consists of a course of experiments in electrical measurements, involving measurement of Resistance by Wheatstone's Bridge, determination of various electrical and magnetic constants, a study of such electrical instruments as galvanometers, ammeters, voltmeters and the simple potentiometer.

Laboratory—Fri. 1-3, second half year. Professor Flammer.

PHYSICS IV.

Required of third year students in Course G.

The work of this class comprises a course of lectures on the Elementary Mathematical Theory of Electricity and Magnetism, and a course of laboratory experiments in advanced electrical measurement.

In the lectures are treated such topics as the more important laws and theories in Electrostatics, the laws of the Magnetic Field, Electrodynamics and Electro-magnetic Induction. Problems are assigned for solution and these are later discussed in class.

Lecture—Thurs. 10-11. Professor W. C. Baker.

In the laboratory the students make detailed study of several groups of experiments. These comprise careful study of galvanometers using both steady and transient currents, measurements of capacities, permeability, insulation resistance, and self and mutual induction, the use of the potentiometer in measurement of electro-motive force of cells, calibration of voltmeters and ammeters, and study of electrical waves and discharge phenomena.

Laboratory—Mon. 2-4, Wed. 2-4. Professor Clark.

PHYSICAL LABORATORIES.

The Physics Department is located in the southern half of Ontario Hall, and contains a large lecture room, with a seating capacity of 125, a small lecture room with seating capacity of 60, a small class room, two large rooms equipped as general elementary laboratories, and one room equipped as an electrical laboratory for advanced work. Besides these rooms are the offices for the staff, a large, well-lighted library and reading room, smaller rooms for special purposes, apparatus and store rooms. The equipment for lecture table and laboratory is steadily growing and comprises all of the more important pieces of apparatus for these purposes.

Research in Physics is being carried on by members of the staff and by senior students. It is desired to extend this activity as far as possible. A limited number of workers who desire to use the facilities of the laboratory may be admitted and assisted. Particulars may be obtained from the Professor of Physics.

LIBRARY.

The library contains text-books, works of reference, and journals devoted to Physics and related subjects. These may be freely consulted by the student in the reading room between the hours of 8 a.m. and 5 p.m. Books may in general be taken from the building overnight upon reporting to a member of the staff and making a record in a book provided for that purpose. It is only by special permission, however, that any book may be kept away longer than one night at a time.

CHEMISTRY.

PROFESSOR—W. L. Goodwin, D.Sc., F.R.S.C.

PROFESSOR—L. F. Goodwin, A.C.G.I., Ph.D., F.I.C.

ASSISTANT PROFESSOR—John Waddell, B.A., Ph.D., D.Sc.

ASSISTANT PROFESSOR—J. A. McRae, M.A., F.I.C.

ASSISTANT PROFESSOR—J. L. McKee, B.A., M.Sc., Ph.D.

FELLOW—

GENERAL CHEMISTRY.

I. **ELEMENTARY**—An introductory course in general chemistry, with experimental demonstrations.

Lectures—Tues. and Thurs. 11-12. Professor W. L. Goodwin.

Laboratory—Sections a, b, c, Tues. 1-4; sections d, e, f, Fri. 1-4.

Professors W. L. Goodwin and J. L. McKee.

Text-books—Smith, *General Chemistry for Colleges*, Revised Edition
(The Century Co.).

Smith, *Laboratory Manual of College Chemistry*.

II. INTERMEDIATE—A course of lectures on qualitative analysis and on the general chemistry of the metals. For students in courses A.C, B.D.

Lecture—Wed. 11-12. Professor McRae.

III. ADVANCED—A course of lectures on advanced general chemistry for students in course B.D.

Lecture—Wed. 4-5. Professor Waddell.

Laboratory—Tues. 2-4.

IV. ADVANCED INORGANIC OR INDUSTRIAL WORK.

Mon. 9-12; Tues. 8-11, 1-2; Wed. 8-10; Thurs. 9-10, 1-3. Under supervision of a professor.

ANALYTICAL CHEMISTRY.

I. INTRODUCTORY QUALITATIVE ANALYSIS. For students in courses A.C, B.D.

Lecture Wed. 1-2.

Laboratory—Wed. 2-4. Professor McRae.

Text-book—A. A. Noyes, *Qualitative Chemical Analysis*, 7th edition.

II. QUALITATIVE ANALYSIS OF SOLIDS, INCLUDING ALLOYS. For students in courses A.C, B.D.

Laboratory—Tues. 1-3. Professor McRae.

III. QUALITATIVE ANALYSIS OF MINERALS. For students in courses A.C, B.D.

Laboratory—Tues. 3-5, Wed. 4-5. Professor McRae.

IV. INTRODUCTORY QUANTITATIVE ANALYSIS, Barium-Chloride, Alkalimetry and Acidimetry, Calcium Carbonate, Magnesium, Sulphate, Coal, Bleaching Powder, Iron Ore, Copper Ore, Nickel Ore, Lead Ore. For students in courses A, B and D.

Laboratory—Courses B, D, Fri. 1-4, Sat. 8-9; Course A, Wed. 2-4, Fri. 1-4. Professor Waddell.

V. INTERMEDIATE QUANTITATIVE ANALYSIS. Feldspar, Titaniferous Iron Ore, Zinc Ore, Arsenic Ore, Chromite, Barite, an Alloy.

Courses—B, Thurs. 10-12, 3-4, Fri. 2-4; C, Mon. 9-10 and 11-12, Thurs. 1-3; D, Thurs. 9-11, 3-4, Fri. 2-4. Professor Waddell.

VI. ADVANCED QUANTITATIVE ANALYSIS. Selected problems and exercises in quantitative analysis.

Courses—B, Tues. 3-5, Fri. 9-12; C, Wed. 3-5, Fri. 9-10, 11-12, 1-2; D, Wed. 1-4; alternate Fri. 8-12. Professor Waddell.

VII. SPECIAL ANALYTICAL COURSE FOR ENGINEERS (Courses E, F, G). The principles of analytical chemistry illustrated by laboratory work in qualitative and quantitative analysis.

Tues. 11-12, Fri. 1-3 (a), 3-4. Professor Waddell.

VIII. QUANTITATIVE ANALYSIS OF INDUSTRIAL PRODUCTS.

Course B, Fri. 8-12. Professor Waddell.

ORGANIC CHEMISTRY.

I. INTRODUCTORY. The subject is treated in a general way in the lectures and students are required to become familiar with laboratory methods in organic chemistry and to make a few typical compounds.

Lecture—Thurs. 11-12.

Laboratory—Courses B, Wed. 2-4; D, Tues. 10-12. Professor McRae.

Text-books—Moore, *Outlines of Organic Chemistry* (John Wiley and Sons).

Norris, *Experimental Organic Chemistry* (McGraw-Hill Book Co.).

II. INTERMEDIATE. The subject is treated in detail in the lectures, and the typical reactions of the different classes of organic compounds are studied in the laboratory.

Lecture—Tues. 10-11, Thurs. 9-10.

Laboratory—Mon. 10-12. Professor McRae.

Text-books—Norris, *Experimental Organic Chemistry*.

Norris, *Outlines of Organic Chemistry* (McGraw-Hill Book Co.).

III. ADVANCED. The lectures deal with selected topics of an advanced character. The laboratory work includes quantitative work and preparations of a more difficult character.

Lecture—Tues. at 11.

Laboratory—Mon. 8-9, Tues. 4-5. Professor McRae.

IV. ORGANIC ANALYSIS. A laboratory course in ultimate organic analysis and in the proximate organic analysis of such materials as foods, carbohydrates, oils and fats, etc.

Wed. 11-12, 1-4. Professor McRae.

V. ADVANCED ORGANIC WORK.

Mon. 9-12; Tues. 8-11, 4-5; Wed. 8-10; Thurs. 9-10, 1-3.

Professor McRae.

PHYSICAL CHEMISTRY.

I. PHYSICAL CHEMISTRY. The various fields of Physical Chemistry are taken up and attention given to the application of the principles involved. For students in courses B, C, D.

Lecture—Fri. 8-9, and alternate Mondays.

Laboratory—Courses B, C, Mon. 1-4; D, Mon. 2-5.

Professor L. F. Goodwin.

Text-books—Walker, *Introduction to Physical Chemistry* (Macmillan & Co.).

Findlay, *Practical Physical Chemistry* (Longmans, Green & Co.).

II. ELECTRO-CHEMISTRY. The theoretical and practical study of electro-chemistry, special attention being paid to problems of industrial importance. For students in courses B and D.

Lecture—Wed. 10-11 and alternate Mondays 1-2.

Laboratory—Mon. 1-4. Professor McKee.

Text-books—Findlay, *Practical Physical Chemistry* (Longmans, Green & Co.).

Le Blanc, *Electro-Chemistry* (Macmillan & Co.).

Elbs-Hutton, *Electrolytic Preparations*, (Edward Arnold).

INDUSTRIAL CHEMISTRY.

I. CHEMISTRY OF MANUFACTURING PROCESSES. The course deals with the manufacture of chemicals, industrial products, and the apparatus employed. Emphasis is laid on the important role played by catalysts and on the applications of the law of mass action. Special attention is given to problems of importance to Canada at the present time such as fertilisers and electro-chemical industries.

The laboratory work is planned to make the student familiar with typical industrial processes, for students in courses B and D.

Lectures—Tues. 8-9, Fri. 1-2.

Laboratory—Sat. 8-12. D course 4th year, Thurs. 1-5 (a); 8-10, 11-12, 1-2 (b). Professor L. F. Goodwin.

Text-book—Thorp, *Outlines of Industrial Chemistry*, (Macmillan & Co.).

II. ENGINEERING CHEMISTRY. A course on engineering chemistry, the subjects dealt with being those of importance to Engineering students, such as the rusting of iron, hard and soft waters, paints, lubricants, explosives and cements, for students in courses A, E and F.

Lecture—Tues. 1-2. Professor L. F. Goodwin.

Text-book—Major Cooper-Key, *Primer*, etc., on Explosives.

Each student, before entering any practical class, is required to deposit five dollars (\$5.00) with the Secretary. On presenting to the instructor of the class the receipt for this, and the class ticket, the student receives the key of his locker and a set of apparatus. The amount of the deposit is returned at the end of the session, breakages, etc., having been deducted.

GORDON HALL—CHEMISTRY

This building, which is entirely devoted to Chemistry, was completed in the autumn of 1911 and is thoroughly modern in every detail. There is on the third floor a large lecture amphitheatre with a seating capacity of 216, on the first floor a small lecture room suitable for advanced classes, and on both the first and third floors are small class rooms intended for tutorial purposes. There are two laboratories for general chemistry, one for medical chemistry and one for electrolysis on the third floor; two for quantitative analysis, one for organic chemistry, and two for food and water analysis on

the second floor; three for qualitative analysis, one for industrial chemistry, one for physical chemistry, and one for gas analysis and electro-chemistry, on the first floor. In addition to these there are several small laboratories where ample accommodation is provided for research, and for spectroscopic or photographic work. Each member of the permanent staff is provided with a private office and laboratory.

The library of the department of chemistry is situated on the second floor and most of the chemical periodicals of importance in both in English and German are kept on file and may be consulted. In addition the library is well provided with modern text-books and works of reference, and there are a few books of historic interest. It has been the aim of the department to build up a consulting library suitable for students undertaking research work. The library is now considered to be well equipped for this work. Students have free access to the library shelves and are allowed to take out books upon application to the attendant in charge.

In the planning of this building special attention has been given to the providing of ample facilities for research and graduate work in both pure and applied chemistry. Students who have obtained the B.Sc. degree will find here all that is necessary to enable them to carry on such advanced work as they may desire.

GEOLOGY.

PROFESSOR—M. B. BAKER, B.A., B.Sc., F.G.S.A.

ASSISTANT PROFESSOR—C. W. Greenland, B.Sc.

In selecting the site for a School of Mining, the Government of Ontario was strongly influenced by the unique situation of Kingston. It has been stated by an eminent Canadian geologist that with the possible exception of Freiberg, in Germany, no school is so well situated for the teaching of Geology as is the Kingston School of Mining. Geology is the study that investigates the history of the Earth and its inhabitants. Within a half hour's walk of the college

the old Laurentian Hills, the back-bone of Canada, are exposed, and lying about their old eroded and disintegrated flanks is the first volume of the geological record from which the Earth's history is to be read. Students are therefore conducted regularly into Nature's museum where geological processes have been at work so long that their results are unmistakably clear.

Within one hundred miles of Kingston there is a greater variety of economic minerals and ores mined than in any other similar area in Canada and possibly in the world. Through the kindness of the managers, these properties are visited by the advanced students and are of inestimable value to them in forming an idea of economic geology and mining engineering.

The Geological and Mineralogical Museum, situated on the ground floor of the Ontario Hall, is equipped with splendid collections of minerals, ores, rocks, and fossils, classified and systematically arranged to illustrate most of the subjects treated of in lectures. This is a section of the work in which the co-operation of the mining public is invited, and all donations to this museum will be kept and credited to the donor.

The various courses in Geology, described in some detail below, are intended to equip the professional geologist, the mining engineer, the civil engineer requiring a knowledge of the relative merits of natural construction material, and the student who does not expect to use the knowledge professionally, but as one of the broadest studies he can take up from a purely educational standpoint. The classes are, therefore, open to Arts students as well as to those of the engineering professions. Graduates or others wishing to investigate a special geological problem will have all possible facilities in the way of laboratories and apparatus at their disposal.

I. ELEMENTARY GEOLOGY. Students taking this class must have passed in Chemistry I. They are also required to take Mineralogy I or Mineralogy V.

An introductory course in general Geology is given preparatory for those students who proceed to a more advanced course in Geology or Mining, and at the same time a more or less complete, though elementary, course for those who do not pursue the subject any farther.

The following subjects will be treated of in the lectures:—The Atmosphere; the Hydrosphere; the Lithosphere; the probable nature of the Earth's interior; the general characters and classifications of rocks; volcanic action; earthquakes; upheaval and subsidence; glaciation; the Geological effects produced by heat, pressure, water; bosses; dykes; veins; stratification; dip and strike; anticline and syncline; faults; foliation; the nature and uses of fossils; stratigraphical Geology, and an outline of the history of the Earth.

The lectures are illustrated by maps, diagrams, and lantern slides. Laboratory work will consist of the examination of hand specimens of the more common rocks.

During the months of October and November excursions will be conducted each Saturday to places of geological interest in the vicinity of Kingston. Students in Geology and Mineralogy are required to take part in these excursions. The cost will not exceed \$5.00. Each student should provide himself with a suitable hammer, specimen bag, and notebook.

For students in courses A, C and E.

Lectures—Tues. and Wed. 9-10. Professor M. B. Baker.

Textbook—Ries and Watson, Engineering Geology.

II. STRUCTURAL, DYNAMICAL, AND PHYSIOGRAPHICAL GEOLOGY. Before taking this class students must have passed in Geology I.

First term: The principles of gradation, deformation, faulting, mountain formation, metamorphism and vulcanism are covered in a more general and a more advanced way than in Geology I. This part of the course is required of students taking courses A and C.

Second term: The origin of the Earth; the metamorphic cycle; types of marine and continental sedimentation; an introduction to paleontology. This course is required of the students taking course C.

Lectures—Wed. 10-11, Mon. 10-11 (b). Professor Greenland.

Textbook—Ries and Watson, Engineering Geology.

Books for Reference:

Chamberlin & Salisbury, *Geology*, Vol. I.

VanHise, *A Treatise on Metamorphism*.

Clark, *The Data of Geochemistry*.

Harker, *The Natural History of Igneous Rocks*.

Davis, *Physical Geography*.

National Geographic Society, *Monographs*.

Assigned Reading.

III. ELEMENTARY PETROGRAPHY. Students must have passed in Geology I, and in Mineralogy II and III.

This course is essentially on igneous geology and petrography, and will consist of lectures on the use of the petrographical microscope and accessories in the determination of rock-forming minerals, and on the determination of some of the more common igneous rocks by both microscopic and field tests. This will be followed by lectures and discussion on the geological occurrences of igneous rocks, the processes of crystalization from magmas, the forms assumed, the textures, and the metamorphic changes that are produced in the mass itself and on its surroundings. The lectures will be illustrated by means of projections of thin sections of rocks, and will be supplemented by laboratory work on hand specimens and rock slices.

For students in courses A and C.

Lectures—Tues. and Thurs. 10-11. Professor M. B. Baker.

Laboratory class two hours per week, in sections, *Mon. 1-3 (1), or 3-5 (2), or Tues. 1-3 (3).* Professor Mather.

Textbooks:

Pirsson, *Rocks and Rock Minerals.*

Luquer, *Minerals in Rock Sections.*

IV. ECONOMIC GEOLOGY. Before taking this class students must have passed in Geology I.

A course of lectures will be given on the genesis of ore deposits, their modes of occurrence, classification, and secondary enrichment. The subject of 'croppings' or gossan formation will be discussed, also the faulting and other disturbances of ore deposits, the tracing of the faulted portions, the surface and underground evidences of faulting, etc. During the term excursions will be made to various mines in the vicinity of Kingston.

For students in courses A and C.

Lectures—Mon. and Fri. 10-11. First term, Professor M. B. Baker.

Textbook—Spurr, *Geology Applied to Mining.*

Books for Reference:

Kemp, *Ore Deposits of the United States and Canada.*

Phillips & Louis, *A Treatise on Ore Deposits.*

Branner, *Syllabus of Economic Geology.*

Proc. A.I.M.E., *Origin of Ore Deposits.*

Rothwell, *The Mineral Industry.*

V. GEOLOGY OF CANADA. Before taking this class, students must have passed in Geology I.

In this course special attention will be given to Stratigraphical Geology, and the distribution of the various rock formations in Canada. The topography as well as the structural make-up of the Dominion is studied. The climatic and economic differences of the various portions of Canada are explained.

For students in courses A and C.

Lecture—Wed. 10-11 (b). Professor M. B. Baker.

Books for Reference:

Brock & Young, *Geology and Economic Minerals of Canada*.
Dawson, *Geology of Canada*.
Chapman, *Minerals and Geology of Ontario and Quebec*.
Reports Geological Survey of Canada.
Reports of the various Provincial Bureaus of Mines.

VI. HISTORICAL GEOLOGY. After a brief study of the various types of sedimentary formations and the principles of paleogeography, the history of the North American continent is taken up with supplementary references to the other continents when desirable. Emphasis is laid on Canadian occurrences. A number of the more important fossils of each period are studied, and their recognition on sight required. Brief consideration is also given to the history of the Science of Geology.
Professor Greenland.

Lectures—Mon. and Thurs. 11-12. Professor Greenland.

Textbook—Schuchert, *Historical Geology*.

Books for Reference:

Schuchert, *Paleogeography of North America*.
Chamberlin & Salisbury, *Geology*, Vols. 2 and 3.
Grabau, *Principles of Stratigraphy*.
Grabau and Shimer, *North American Index Fossils*.
Zittel, *Text-Book of Paleontology*.
Various Authors, *Outlines of Geologic History*.
Geikie, *Founders of Geology*.
Zittel, *History of Geology*.

VII. ADVANCED PETROGRAPHY. A course of lectures will be given on the microscopic characters and classification of igneous rocks, and on their general field characters, origin and classification. The lecture work will be supplemented by assigned special reading and by laboratory work with both hand specimens and microscopic slides. Special attention will also be paid to the metamorphic rocks.

Lecture—Fri. 10-11. Professor Baker.

Books for Reference:

Harker, *The Natural History of Igneous Rocks.*

Kemp, *Hand Book of Rocks.*

Iddings, *The Origin of Igneous Rocks.*

Iddings, Weed, Pirrson, Washington, *Classification of Igneous Rocks.*

Rosenbusch-Iddings, *Microscopical Physiography of Rock-forming Minerals.*

Rosenbusch, *Die Massige Gesteine, Element der Gesteinslehre.*

Laboratory class two hours per week, to be arranged to suit students' time-table. Professor M. B. Baker.

VIII. ECONOMIC GEOLOGY. The work in this class is supplementary to that in Geology IV, and is an illustration of the principles of ore deposition studied in that class. For this purpose type deposits in the largest producing districts throughout the world are studied in some detail. It is, of course, impossible to treat of all products, but the basis of classification and the fundamental principles underlying economic deposits are studied with particular reference to iron, copper, nickel, zinc, lead, silver, gold, aluminium, peat coal, gas, oil, salt, abrasive and refractory materials. A few lectures on building stone as well as on clays and the manufacture of clay products will be given.

For students in courses A and C.

Lecture—Mon. 3-4, Tues. 11-12. Professor M. B. Baker.

Books for Reference:

Lindgren, *Mineral Deposits.*

Ries, *Economic Geology of the United States.*

Beck, Trans. by Weed, *Nature of Ore Deposits.*

Kemp, *Ore Deposits of the United States and Canada.*

Merrill, *The Non-metallic Minerals.*

Hancock, *Notes on Applied Geology.*

Mineral Statistics of the Geological Survey U.S. and Canada.

IX. ENGINEERING GEOLOGY. This course is intended for students in Civil Engineering, and will treat of the occurrence, composition, texture, structure, and alterations of rocks, with special reference to their effects on the workability or removal of the rocks in excavation, and in the selection of raw material in construction work. There will also be lectures on clay-products and the selection of building materials, and an outline of the manufacture of bricks, fire-proof blocks, terra-cotta, roofing-tile, sewer-pipe, and drainage-tile, will be given. Physiography and drainage will also be studied, and a brief summary of the Geology of Canada will be made.

For students in course E.

Lecture—Thurs. 9-10. Professor M. B. Baker.

Textbook—Ries & Watson, *Engineering Geology*.

Books for Reference:

Gillette, *Rock Excavation, Methods and Cost*.

Merrill, *Stone for Building and Decoration*.

Howe, *The Geology of Building Stone*.

Searle, *The Clay-Workers' Hand-book*.

X. FIELD AND LABORATORY GEOLOGY. The laboratory exercises in this course are designed to illustrate by means of specimens, models, photographs, maps and sections, the principal original and secondary structures of rock; the origin and mode of occurrence of rocks in the earth's crust, their cycles of alteration and change; their interpretation and representation in geological surveys.

The field work comprises observations upon the weathering of rocks; **shore phenomena**; **glacial phenomena**; igneous and sedimentary rocks; **faulting**; **folds**; **joints**; **cleavage**; **schistosity**. Practice in methods of surveying and geological mapping and construction of sections; measuring the thickness of strata and determining the relative ages of geological structures, and the preparation of a map to scale.

Two working hours per week will be arranged to suit the class at the beginning of the first term.

MINERALOGY.

PROFESSOR—N. L. Bowen, M.A., B.Sc., Ph.D., F.G.S.A.

LECTURER—C. W. Greenland, B.Sc.

The work in this department is intended for students taking the courses in (1) Mining and Metallurgical Engineering, (2) Analytical and Applied Chemistry, (3) Mineralogy and Geology, (4) Chemical Engineering, and (5) Civil Engineering.

It consists of six sections, viz.: Mineralogy I, II, III, IV, V and VI.

Students in Course A take section I in the second year and sections II, III and IV in the third year.

Students in Courses B or C take section I in the second year, sections II, III and IV in the third year, and section VI in the fourth year.

Students in Course D take section I in the second year.

Students in Course E take section V in the fall term of the second year.

I. ELEMENTARY MINERALOGY. The work in this class is intended as a preparation for those entering upon the studies of geology, petrography, mining and metallurgy. The class should be taken in the second session, after the Chemistry and Physics of the first session, as a knowledge of Chemistry and Physics is necessary for a proper comprehension of the subject. The regular work consists of (1) a course of lectures and demonstrations on crystallography at the beginning of the fall term, (2) illustrated lectures on the physical, optical and other properties of minerals, (3) the description of about sixty prominent Canadian minerals, (4) practical work in the determination of these by means of the blowpipe and field tests, (5) excursions on Saturdays of October and November for field work, or in case of unfavorable weather, practical work in the laboratories or museum. Students are urged to make use of the museum in the basement, and of the study room provided for them in the mineralogical department.

Each student is supplied for the session with a locked cabinet and collection of minerals for which he is held responsible, and for which a deposit must be made. The practical work of the class is conducted in the mineralogical and blowpipe laboratory, where cabinets containing specimens of commonly occurring minerals are arranged for use. Students are taught to recognize minerals by simple field tests, such as form, colour, streak, hardness, specific gravity, etc. For this work students must provide themselves with pocket-lens, knife, streak-plate and magnet, and must supply their own blowpipe apparatus.

Saturday Excursions.

Lecture, Tues. 11-12. Professor Bowen.

Blowpipe Class, Fri. 10-12. Mr. Greenland.

Text-books—Williams, *Crystallography* (Henry Holt & Co.).

Ford, *Dana's Manual of Mineralogy*, 15th Ed., 1912 (Wiley and Sons).

Books for Reference—Crosby, *Tables for the Determination of Minerals*.

Eakle, *Tables*.

Moses & Parsons, *Mineralogy, Crystallography and Blowpipe Analysis*, 2nd Ed.

Brush & Penfield, *Manual of Determinative Mineralogy and Blowpipe Analysis*, 17th Ed., 1912 (Wiley & Sons).

Books from the Department Library and from the Professor's private library may be obtained from the Professor.

II. SYSTEMATIC MINERALOGY. The work of this class is intended for those taking courses B and C, and is preparatory to the work in geology, petrography, and descriptive and determinative mineralogy, which should be taken during the session following.

The regular work consists of a course of lectures, three hours per week, dealing with the physical and other properties of minerals, illustrated by specimens from the lecture cabinet, microscopic slides, thin sections, models, charts and lantern slides. Essays on prescribed subjects are required.

Lectures—Mon. 11-12, Wed. 8-9, and one hour to be arranged with class; first term. Professor Bowen.

Text-books—Dana, *Text-book of Mineralogy*, 1914. (Wiley & Sons).

Williams, *Crystallography*. (Henry Holt & Co.).

Books for Reference—Miers, *Mineralogy*.

Tschermak, *Mineralogie*.

Brauns, *Mineralreich*.

III. OPTICAL MINERALOGY. The work of this class is intended for those students only who are taking Course A, Mining Engineering, Course B, Analytical and Applied Chemistry, and Course C, Mineralogy and Geology. It is preparatory to the classes of petrography and determinative mineralogy, which should be taken during the session following. The lectures treat of light and the optical properties of minerals. Reflections, diffusion, refraction, dispersion, polarization, absorption, color, etc., are described and illustrated by the use of the lantern and projection apparatus.

Lectures—Mon. 11-12, Fri. 9-10, second term. Professor Bowen.

Text-book—Dana, *Text-book of Mineralogy*, 1914. (Wiley & Sons).

IV. DESCRIPTIVE AND DETERMINATIVE MINERALOGY. The work of this class consists in the exhibition and description of the mineral specimens contained in the several museum collections, special attention being given to ores, gangue-minerals, those having a commercial value and those of importance as rock-forming minerals in geology. By field tests and the use of the blowpipe and the petrographic microscope, practice is obtained in the determination of minerals. Cabinets furnished with specimens of minerals from various parts of the world are supplied for students' use. The number of specimens is being constantly increased by collection, donation, exchange and purchase, the aim being to make the collection as complete as possible.

For students in courses A, B, C.

Tues. 8-9, 1-3, Wed. 1-2. Professor Bowen.

Text-books—Dana, *Text-book of Mineralogy*, 1914. (Wiley & Sons).

Brush & Penfield, *Manual of Determinative Mineralogy and Blowpipe Analysis*, 17th Ed., 1912. (Wiley & Sons).

V. PREPARATORY MINERALOGY. The work of this class is intended for students taking the course in Civil Engineering—Course E—and for those who attend the class of Geology I, without any previous knowledge of mineralogy.

The work consists of a course of about a dozen practical demonstrations, one hour per week during the fall term, to make students familiar with the more common rock-forming minerals and ores, so that the geology lectures may be more intelligible. The students are taught to recognize minerals by field-tests, such as form, colour, lustre, streak, hardness, specific gravity, etc.

Lecture—Wed. 11-12 (a). Mr. Greenland.

The attention of students is called to the collection of minerals on exhibition in the students' study, and to the several collections in the museum in the basement. Students in this class should attend the Saturday excursions. Text-book—Miller, *Minerals and How They Occur*.

VI. MINERAL TECHNOLOGY. A course of lectures, illustrated by specimens and lantern slides, supplemented by demonstrations in the museum showing the occurrence and industrial uses of minerals and mineral products.

The following mineral products will be treated: Abrasives, Refractories, Glazes, Ceramic Ware, Lime, Cement, Plaster, Fertilizers, Pigments, Insulators, Gems, etc.

Lecture—Wed. 8-9. Professor Bowen.

PASS ANIMAL BIOLOGY.

PROFESSOR—A. P. Knight, M.A., M.D.

LECTURER—A. B. Klugh, M.A.

This course will deal with the outlines of classification. The lectures and demonstrations are suitable for the course in Mineralogy and Geology (C), and are held throughout the session.

*Lectures or demonstrations—*Hours to be arranged. Mr. Klugh.

Work in the museum at an hour to be agreed upon.

Textbook—Linville & Kelly, *A Textbook in General Zoölogy*.

BACTERIOLOGY.

PROFESSOR—W. T. Connell, M.D.

This course is for students in Course B, and it consists of two laboratory hours per week.

Laboratory—Thurs. 10-12.

MINING ENGINEERING.

PROFESSOR—J. C. Gwillim, B.Sc.

ACTING PROFESSOR—Stanley Graham, B.Sc.

Under this heading are placed the subjects, Mining I, Mining II, and Ore Dressing.

Mining I and Ore Dressing are taken by third year students in Mining and Metallurgy; Mining II by students of the fourth year.

Students in Course C (Mineralogy and Geology) take Ore Dressing in their third year; and Mining I in their fourth year.

Students in Course D (Chemical and Metallurgical Engineering) take Ore Dressing in their third or fourth year.

The subjects of Mining and Metallurgy IV or (Metallurgy, Mining and Mill Designing) are taken up, practically, by all fourth year students in the Mining and Metallurgical Engineering course. A Summer Essay, compiled from field observations, is also required.

MINING I.

ORE DEPOSITS. Conditions which produce and indicate them; their nature and origin; their affinity with certain conditions and rocks, and their classification. These lectures are supplementary to the study of economic geology.

PROSPECTING. Methods used in prospecting for lode, placer and coal mines. Location, laws, and requirements, of mineral prospects and their examination.

DEVELOPMENT OF PROSPECTS. The early workings of mines, with a consideration of the many factors entering into the proving up of mineral bodies as commercial quantities.

BORING. The use of long distance drills for prospecting, and for reaching fluids. The rotary Diamond drill, and the Percussion drills; their fields of operation and relative merits.

EXCAVATION. The tools and machines used in breaking and removing rock. Also hand and power drilling to place explosives. The common mining explosives; their uses and operation.

MINING METHODS. A consideration of the main factors in developing a mine. The sinking of shafts; driving of tunnels, etc. The stoping or winning of minerals from the vein or ore body.

Lectures Tues. 9-10(b), Wed. 11-12. Fri. 8-9(a). Professor Graham.

ORE DRESSING.

These lectures follow quite closely the subject as taken up in Richards' Text-book of Ore Dressing. They follow the sequence of operations from the arrival of crude ore or mill-rock at the mill until it leaves as a concentrate or bullion. Miscellaneous processes such as magnetic separation, flotation air processes, and coal washing, are discussed separately.

The chief features of this subject are to teach the principles and operations of rock crushing and grinding, stamp milling with amalgamation, screening and sizing of crushed ore, classification of sands and slime by water, as a preparation for the separation of minerals by jigs, tables, and other devices of proved efficiency.

For students in courses A, C, D.

Lectures—Mon. 8-9, Thurs. 11-12. Professor Graham.

Books of Reference:

Richards, *Text-book on Ore Dressing.*

Louis, *The Dressing of Minerals.*

Wiard, *The Theory and Practice of Ore Dressing.*

MINING II.

PLACER MINING. Consideration of alluvial deposits and their origin. Placer mining proper, hydraulic placer, and gold dredging.

SUPPORTS. Various forms of timbering or supporting a mine's passages and stope excavations. The timbers used. Costs and alternative methods. Causes of decay in timbers and their preservation. The use of iron and masonry.

TRANSPORTATION. The handling of material underground, by chutes, cars, and hoists; rope and locomotive haulage. Surface transportation by road, rope, and railway. Loading, unloading, and terminal arrangements.

HOISTING. Head frames, ropes, and drums; various systems which balance the load to some extent or give a steady load on the engines. Hoisting of ore. Safety appliances and signalling.

DRAINAGE. Sources of water, drainage by tunnels; hoisting of water; use of pumps, and principal types for light and heavy work. Bulkheads.

VENTILATION. Natural and artificial conditions which demand ventilation. Methods of ventilating metal and coal mines. Gases of a coal mine. Fans, and distribution of air in coal mines.

LIGHTING. Use and place of candles, lamps, and safety lamps.

ACCIDENTS. PRINCIPLES OF EMPLOYMENT.

MINE EXAMINATION AND VALUATION.

STUDENTS' PAPERS. These are hour or half hour talks upon observations from experience in the field, *Thursday 2-3.*

Lectures—Mon. 10-11, Wed. 9-10, Thurs. 2-3. Professor Graham.

Books of Reference:

- (1) C. LaNeve Foster, *Ore and Stone Mining.*
- (2) Ihlseng, *Mining Manual.*
- (3) *The Coal and Metal Miners' Pocket-book.*
- (4) H. W. Hughes, *Coal Mining.*
- (5) *Current Mining Journals, etc.*

MINING AND METALLURGY IV.

The first term work includes some problems, also the reduction and plotting of a mine survey.

In the second term these hours are given to furnace and metallurgical work for four weeks, after that to any subject suitable to the course, as a subject for designing, for example, the designing of a mill, smelter, surface plant of a mine, or equipment to illustrate the summer essay.

Tues. 2-4, Wed. 1-5. Professors Graham and Drury.

SUMMER ESSAY.

In order to encourage close observation, and the faculty of expressing by text and illustration, the student during his summer vacations is expected to gather material for an essay of from two to three thousand words.

Such an essay neatly presented with sketches or illustrations may be included as part of the work in Mining and Metallurgy IV.

The subject title must be given in by the end of the first term of the final year, and the essay handed in before the end of the second term of the final year.

MILLING.

The machinery in the Mill is in most cases of standard sizes and the ores treated are in sufficient quantities to give results which are about the same as commercial practice would give. The uses of the Mill and Laboratories are to furnish training and illustration, to experiment with various processes, and to give help at very reasonable rates to those who are seeking some method of treatment. The ores received are sufficient in quantity and variety to illustrate most of the usual methods of treatment found in actual practice. The work is divided into three main portions.

(1) Stamp Milling, Cyanidation, Chlorination and other Metallurgical processes in the first term.

(2) Concentration processes in the second term.

Fri. 8-4, Sat. 8-12. Professors MacKay and Graham.

THE MINING AND METALLURGICAL LABORATORIES.

These are equipped for the testing of ores in small lots from various mining districts.

The equipment of the mill as it stands at present consists of the following:—10 in. by 7 in. Blake jaw crusher; 16 in. crushing rolls; 5 stamp battery, 850 lbs., stamps with automatic feeder; 10 in. cone grinder; No. 0 Krupp Ball Mill; impact screen; inlet discharge classifier; vertical line classifier; U-tube classifier for slimes; perforated board classifier for slimes; cone classifier and 8-foot Callow tank; 3 compartment spitzkasten; 3 compartment Hartz jig; 2 compartment Evans high-speed jig; 1 Vezin jig; 4 ft. Frue Vanner; Wilfley table (riffle washer); 8 foot callow tank; Wetherell magnetic concentrator; Ball-Norton magnetic separator; Kingston magnetic separator, dry or wet; Behrend dry concentrator; Sturte-

vant exhauster and blower; Heald and Sisco centrifugal pump; Frenier and Sons' spiral sand pump; Cazin water-motor; Northey mine pump; centrifugal machine for slime treatment; Johnston filter press for slime treatment; Ingersoll-Sergeant rock drill; Mac Machine Company's balanced valve rock drill; Rand rock drill; tripods for rock drill; drifting column for rock drill; Jackson's hand power rock drill; barrel chlorination plant; experimental cyanide apparatus with an air agitator and vacuum filter; Case Laboratory flotation machine; Wood flotation machine.

THE MINING AND MILLING LABORATORIES

With the exception of the work given in the Mining and Milling Laboratories all the work in the Department of Mining and Metallurgy is given in Nicol Hall. In the basement of the building there are a large number of furnaces and four laboratories. On the first and second floors are the lecture rooms, draughting room and library.

The Metallurgical laboratory is well equipped with furnaces which may be classed as follows: —

One large blast-furnace (40" by 24") with a bag-house (16 bags); one large roasting furnace (10' by 4') with three charging doors; one Monarch oil furnace for obtaining temperatures up to 1400°C.; one Hoskins electric resistance furnace for temperatures up to 1700°C.; one vacuum electric furnace; two tubular electrical furnaces; six gas muffle-furnaces and eight gasoline furnaces.

In the rear of the basement there is a sampling room with power and hand grinding machines and apparatus for preparing the necessary samples for the assay laboratories.

The greater part of the eastern half of the basement is devoted to fire assaying. These laboratories are equipped with fluxing and balance tables; gasoline crucible furnace; gasoline, gas, and oil muffle furnaces; and accessory apparatus.

A separate balance room is fitted with assay and chemical balances to be used in connection with this fire assaying and the chemical work carried out in the two front rooms. The latter

laboratories will accommodate the final year students in Mining and Metallurgy, and be used in conjunction with the Milling and Metallurgical laboratory work.

A small room in front is fitted for electrolytic assaying.

The western half of the basement is devoted to Metallurgical laboratories and is equipped with electric furnaces, blast furnaces, roasting furnaces, etc., and with sufficient power for extended research work.

The Metallurgy lecture room, second research laboratory, cloak-rooms, etc., are on the first floor; and the Mining lecture room, draughting room and students' library on the second floor.

METALLURGY.

PROFESSOR OF METALLURGY—G. J. MacKay, B.Sc.

PROFESSOR OF ELECTRO-METALLURGY AND METALLURGICAL RESEARCH—C. W. Drury, B.Sc., Ph.D.

METALLURGY I.

A thorough drilling in fuels, the special metallurgical uses of each kind, determination of calorific power, experimentally and by calculation from composition, calorific intensity and methods of pyrometry, charcoal manufacture, coals, coke, coking methods, producer gas and its manufacture in modern approved appliances, liquid fuels, etc. This is followed by a brief discussion of the physical properties and uses of the common metals. During the second term special attention is given to the study of the properties of iron and steel and the effect of the method of manufacture on these properties.

Lectures—Tues. 11-12, Wed. 8-9. Professor MacKay.

METALLURGY II.

Hydro-metallurgy of gold and silver.

Milling and amalgamation of gold and silver ores.

Metallurgy of copper, including treatment of native copper and sulphide ores by concentration and smelting, reverberatory and blast furnace matting, pyritic smelting, refining, and hydro-metallurgy.

Metallurgy of lead, including reverberatory and blast furnace practice, softening, desilverising, refining, etc.

Metallurgy of iron and steel, including preparation of the ore for smelting, production of pig iron in the blast furnace, conversion into wrought iron in the puddling furnace, manufacture of steel by the crucible, Bessemer and open-hearth processes.

Also the consideration of the ordinary methods of recovering zinc, nickel, cobalt, tin, mercury, arsenic, antimony, etc., from the ores.

One hour each week will be devoted to examinations and the discussion of metallurgical subjects by the students.

For students in courses A, C and D.

Lecture and recitation—Mon. 9-10, Tues. 9-10, Wed. 11-12, Thurs. 9-10.
Professor MacKay.

METALLURGY III.

Electro-metallurgy; introductory course in electro-chemistry followed by the consideration of the electric smelting of aluminium, copper, magnesium, iron, etc.

Lecture—Thurs. 2-3 (b). Professor Drury.

METALLOGRAPHY

Introductory course in metallography, including:

(a) Explanation and interpretation of equilibrium diagrams.

(b) Constitution and structure of some industrial alloys, with special reference to brasses, bronzes, bearing metals and different grades of steel.

Lecture and laboratory work—time to be announced later.

Professor Drury.

METALLURGICAL LABORATORY

Laboratory course dealing with a number of metallurgical operations. The following experiments are made by the students attending this course; determination of calorific power and impurities in coals, desilverization of lead by the Parke's process, standardization of pyrometers by various methods, determinations of cooling curves, recombination of sulphates, and reduction of oxides.

Electroplating, operation of the blast-furnace and electric furnace, and laboratory work in metallography.

Lecture—Wed. 1-2.

Laboratory—2-5 p.m. Professor Drury.

FIRE ASSAYING.

The Laboratory course in fire assaying consists of:

(a) A number of experiments to test the action of the different reagents used and slags made in assaying.

(b) The determination of lead by fire assay methods.

(c) The determination of gold and silver in silicious, oxidized, and sulphide ores and mattes.

(d) The assay of gold and silver bullion.

For students in courses B and D.

Lecture—Sat. 8-9, Laboratory 9-12, second term. Professor MacKay.

CHEMICAL ENGINEERING.

PROFESSOR—L. F. Goodwin, A.C.G.I., Ph.D., F.I.C.

CHEMICAL ENGINEERING I.

INDUSTRIAL PROCESSES. The chemistry of various important chemical manufactures is studied in detail, and its influence on the design and construction of the manufacturing plant discussed. The newest applications of electric power in the manufacture of caustic soda, fertilisers, and explosives are studied and discussed.

DESIGNING OF CHEMICAL PLANT. Calculations and exercises in designing chemical apparatus and factories. Considerations underlying the choice of materials of construction. The design of a nitric acid plant. The general design of a sulphuric acid works. The design of a chemical plant based on experimental results worked out in the laboratory.

Lectures—Tues. 10-11, Wed. 9-10, Thurs. 10-11.

Laboratory—Tues. 9-10, Wed. 11-12, Thurs. 1-3.

CHEMICAL ENGINEERING II.

LABORATORY WORK AND DRAWING. Technical methods of analysis, including rapid methods, and those involving the use of special apparatus and conditions.

The elaboration of the best working conditions for a given chemical process in the laboratory.

The designing and drawing of parts of a chemical plant based on laboratory results.

The practical work will be divided between the laboratory and the draughting room as is found necessary.

Laboratory and draughting room—Fri. 8-12 (alternate weeks), and 1-3; Sat. 8-12, first term.

LABORATORY OF CHEMICAL ENGINEERING.

The laboratory is provided with large size models of a ball mill, of steam-jacketed evaporating pans, both plain and porcelain lined and fitted with stirring gear, with a steam-jacketed rectifying column and still, with a high pressure acid proof filter, with a Sweetland self-dumping filter press, with several types of vacuum filters, with a high speed centrifuge, and with other technical apparatus.

There is further installed a large reaction tower of earthenware designed for experimental purposes, connected to a fan and ventilating flues, and provided with a liquor circulating system and with selected types of earthenware filling material.

A portable electro-motor is available for power purposes, as well as electric current up to 75 amperes at 17 volts, and 5 kilowatt at 110 volts.

There are also installed balances for the rapid weighing of small and large quantities, together with various types of special analytical apparatus.

The instruction in this laboratory is planned to accustom the student to handle fairly large quantities of materials and to become familiar with standard types of technical chemical apparatus, as well as to work out the experimental methods required for attacking a problem, and to translate the laboratory results obtained into practice.

CIVIL ENGINEERING

PROFESSOR—W. P. Wilgar, B.Sc., on military service.

ACTING PROFESSOR—J. B. Harvey, M.Sc., A.M.E.I.C.

ASSISTANT—W. H. Slinn, B.Sc.

The hours shown below are temporary, subject to change and therefore do not correspond with Time-Table at back of Calendar.

GENERAL ENGINEERING

This subject embraces the physical properties of materials used in the different branches of engineering and the principles involved in the theory of beams, columns, and structures.

I. MATERIALS OF CONSTRUCTION. Strength and quality of timber, stone, brick, cement, mortar, and concrete; physical properties of the metals and alloys used in engineering, and effects of impurities in them; testing for tensile, compressive and transverse strength.

GRAPHICAL STATICS. Graphical representation of stresses; funicular and force polygons; dead and wind loads; graphical methods of determining centres of gravity, shearing forces and bending moments.

MECHANICS OF MATERIALS. Resistance and elasticity of materials; stress and strain diagrams; bending moments and shearing forces; compound stresses; deflection of beams; columns and struts; riveted joints; centres of gravity and moments of inertia.

For students in courses B.D., E.F.G.

Lectures Mon. 11-12; Thurs. 9-10. Professor Harvey.

Textbooks:

Malcolm, *Graphic Statics*.

Merriman, *Mechanics of Materials*.

Books of Reference:

Merriman, *Strength of Materials*.

Thurston, *Materials of Construction*.

Merriman and Jacoby, *Roofs and Bridges, Part II*.

Slocum & Hancock, *Strength of Materials*.

II. GRAPHICAL STATICS. Graphical determination of stresses in roof trusses, bridges, cranes, earth-works, retaining walls, dams, arches, arched ribs, cantilever and suspension bridges.

MECHANICS OF MATERIALS. Analysis of restrained and continuous beams and columns; torsion of shafts; combined stresses; flexure of

beams and theorem of three moments; plate and lattice girders and columns; resilience and fatigue of materials; initial and temperature stresses; earthworks, retaining walls and dams; arches and arched ribs; suspension bridges.

THEORY OF STRUCTURES. Girders, roofs and bridges; selection of types with reference to span, loading, head-room, cost, and other considerations; relative advantages of riveted and pin connections;; wind bracing and stiffening trusses; trestles and towers.

For students in courses D, E, F, G.

Lectures—Mon. 1-2, Wed. 10-11. Professor Harvey.

Textbooks—Malcolm, Graphic Statics.

Merriman, *Mechanics of Materials.*

Books of Reference:

Slocum & Hancock, *Strength of Materials.*

Bovey, *Theory of Structures.*

Merriman and Jacoby, *Roofs and Bridges, Parts I, II, III.*

III. This course consists of practical work in the drafting rooms, mechanical, electrical, and testing laboratories. Its object is to give the student a knowledge of the practical application of the fundamental principles of engineering in general.

Routine tests of cement, lime, mortar, brick, stone, timber, iron, steel, etc. Specific gravity, fineness, tensile and compressive, strength of cement, etc.

Measurement of mechanical power by means of indicators, dynamometers, etc. Simple experiments in thermodynamic laboratory.

Measurement of electrical power. Simple tests of motors and generators. General electrical measurements.

For students in courses A, D, E, F, G.

Laboratory and Draughting Room—Thurs. 1-3.

Professor Guillet, Professor Henderson and Mr. Slinn.

IV. This course is for Civil Engineering students of the fourth year, and consists of independent work in the testing laboratories.

Laboratory—Wed. 2-4. Professor Harvey.

V. Lectures in this course comprise methods of tunnelling, including the care, handling, storing, qualities and use of the various explosives used in Engineering works.

VI. For students in Civil Engineering, third year only.

GRAPHICAL REPRESENTATION. Representation of engineering formulae and data. Progress and cost diagrams, interpretation of diagrams, solution of problems by means of diagrams.

GRAPHICAL STATICS. Continuation of work in General Engineering II, with relation to roofs, bridges, arches and other structures. Practical work in draughting room.

For students in course E.

Lecture—Wed. 11-12. Mr. Slinn.

Draughting Room—Tues. 1-4 (b).

STRUCTURAL ENGINEERING

The hours shown below are temporary, subject to change and therefore do not correspond with Time-Table at back of Calendar.

Students about to take Structural work should have completed Mathematics I and II, and General Engineering I.

I. BUILDING CONSTRUCTION. Foundations of buildings, walls, etc. Design of floors, floor beams, walls, roofing materials and other parts of buildings. Joints in wood, stone and steel.

Stone cutting and masonry. Concrete and reinforced concrete. Steel frame construction.

Students will be required to make independent designs of the various structures dealt with in the lectures.

For students in courses D, E, F.

Lecture—Tues. 8-9. Professor Harvey.

Draughting Room—Fri. 1-4.

Text-book—Taylor and Thompson, *Concrete, Plain and Reinforced.*

II. FOUNDATIONS. Foundations of bridges, buildings and other structures, open wells, coffer dams, caissons, substructure types and designs, specifications and estimates.

Lecture, Tues. 8-9. Professor Harvey.

Draughting Room—Fri. 1-4.

Text-book:—Jacoby and Davis, *Foundations of Bridges and Buildings.*

Books of Reference:—Patton's *Foundations.*

Baker, *Masonry Construction.*

III. DESIGN OF STRUCTURES... Roofs. Beam, plate girder and truss spans as designed for highways, according to standard specifications. Aesthetics of bridge designing.

Complete stress sheets, working drawings, and estimates are required.

Lecture—Wed. 11-12. Professor Harvey.

Laboratory Mon. 1-4.

Draughting Room—Mon. 2-5.

Text-books—Thayer, *Structural Design*, Vol. II.
Cambria Steel Hand-book.

Books of Reference—Merriman and Jacoby, *Roofs and Bridges*, Pts. I, II, III.

IV. DESIGN OF STRUCTURES Lectures comprise the design of details in bridge trusses and other structures, being a continuation of Structural Engineering III.

Projects will be given to the class in Bridge Design according to Standard Specifications, usually consisting of a wooden Howe truss, riveted truss, pin-connected truss, etc. Complete stress sheets, working drawings, estimates, etc., being required.

Lecture—Tues. 9-10. Professor Harvey.

Draughting Room—Tues. 2-5, Fri. 9-12.

Text-books—Thayer, *Structural Design*, Vol. II.
Cambria Steel Hand-book.

Books of Reference—Merriman and Jacoby, *Roofs and Bridges*, Pts. I-IV.
Waddell, *Bridge Engineering.*

HYDRAULIC ENGINEERING

The hours shown below are temporary, subject to change and therefore do not correspond with Time-Table at back of Calendar.

Comprises the study of Hydraulics, Canals, Harbors, River Improvements, Water Power, Irrigation, etc.

I. HYDRAULICS. Application of hydrostatic pressure in the case of dams, gates and pipes. Flow of water and measurement of its volume by various orifices and weirs. Flow in open channels, ditches, flumes, etc., and the use and application of these conductors of waters. Flow through tubes and pipes. Use of pipes as conductors of supply for domestic and power purposes. Dynamic and static pressure as applied to motors for power purposes. The efficiency of various water wheels, turbines, etc.

For students in courses E and F.

Lectures—Tues. and Thurs. 10-11. Professor Harvey.

Text-book:—Merriman, *Hydraulics.*

II. Comprises the study of hydrography; design and construction of dams and appendages; measurement, development and transmission of water-power; design of hydraulic power plants; river improvement; design and construction of canals and harbors.

Lecture—Wed. 11-12. Professor Harvey.

Text-book—Mead, *Waterpower Engineering*.

Books of Reference:—Watt, *Improvement of Rivers*.
Frizell, *Water Power*.

RAILWAY ENGINEERING

The hours shown below are temporary, subject to change and therefore do not correspond with Time-Table at back of Calendar.

I. The effects of location on traffic. Curves, rise and fall, minor and ruling grades, distance, etc., as affecting operation. Railway Acts of Canada in relation to construction. Engineers' duties on construction, calculation of progress and final estimates.

Lectures—Thurs. 11-12, Fri. 10-11. Professor Harvey.

Field Work and Draughting Room—Wed. 2-4.

Text-book:—Webb, *Economics of Railroad Construction*.

Book of Reference: Wellington's *Railway Location*.

II. CONSTRUCTION. Practical methods and costs of grading. Track laying, ballasting, etc. Types, designs, and methods of construction of timber trestles, box and arch culverts. Concreting and its inspection.

Lecture—Mon. 9-10. Professor Harvey.

Draughting Room—Thurs. 1-3.

Books of Reference:—Gillet, *Cost Data*; Webb, *Railroad Construction*.

III. MAINTENANCE. The upkeep of tracks, bridges and buildings, their inspection and methods of repairs and renewals. The duties and responsibilities of the persons in charge.

Lecture—Mon. 9-10. Professor Harvey.

Text-book:—Tratman, *Railway Tracks and Track Work*.

YARDS AND TERMINALS. General design of railway yards and terminals, including round houses and other essential buildings.

Draughting Room—Thurs. 1-3.

Lecture—Fri. 8-9. Professor Harvey. Fall term.

Text-book:—Tratman, *Railway Tracks and Track Work*.

Books of Reference—Orrock's *Structures and Estimates*.
Droege, *Freight Terminals and Trains*.

MUNICIPAL ENGINEERING

The hours shown below are temporary, subject to change and therefore do not correspond with Time-Table at back of Calendar.

I. DISCUSSION OF MUNICIPAL PROBLEMS.

II. WATER SUPPLY. Municipal water supply. Rainfall. Source of supply. Quantity, quality and purification of water. Distribution, designing, and details of construction. Domestic systems.

Lecture—Tues. 11-12. Professor Harvey.

Text-book:—Turneure and Russell, *Public Water Supplies.*

III. THE COLLECTION AND DISPOSAL OF SEWAGE AND REFUSE.

SEWERAGE. The various systems of collection and removal of sewage. Design. Consideration of rainfall, run off, and water consumption. Proportioning of size. Grades and flow in sewers. Methods of construction and materials used. Plumbing. Maintenance of sewer systems, including ventilation, flushing, and inspection. Assessments.

Text-book:—Ogden, *Sewer Design.*

Books of Reference:—Ogden, *Sewer Construction.*

Folwell, *Sewerage.*

SEWAGE DISPOSAL. Methods employed. Design, construction, and maintenance of the various systems, including bacterial treatment. Refuse disposal. Kinds of refuse. Methods of collection and disposal and economic value of same. Incinerators.

Books of Reference:—Fuller, *Sewage Disposal.*

Kinnicutt-Winslow-Pratt, *Sewage Disposal.*

REFUSE DISPOSAL. Kinds of refuse. Methods of collection and disposal and economic value of same. Incinerators.

Lecture—Wed. 1-2. Professor Harvey.

Municipal Engineering I, II, and III, and Highway Engineering include practical work, three hours per week, Saturday, 9 to 12. Projects in water works, sewer designs and paving are set and completed during these hours. As far as possible each student will be given separate problems. A time limit is set on each problem.

HIGHWAY ENGINEERING

Country and city roads and pavements. Lay out, grades, and roadbeds. Various kinds of pavements and methods of construction. Cost and durability. Gutters, curbs, and gullies. Various kinds of walks, methods of construction, materials used. Method of dust prevention. Construction with street railway track. Methods of assessment. Conduit systems, and lighting of streets.

ELECTRIC RAILWAYS. Trackwork, including construction in paving, power supply, cars and car types, factors entering into economics of construction and operation.

Lecture—Wed. 9-10, Fri. 8-9 (b.) Spring Term. Professor Harvey.

Text-book—Blanchard and Drowne, Highway Construction.

Books of Reference—Byrne, Highway Engineering.
Baker, Roads and Pavements.

SURVEYING

The hours shown below are temporary, subject to change and therefore do not correspond with Time-Table at back of Calendar.

All branches of Surveying receive full consideration. During the outdoor instruction students are given every opportunity to become familiar with the instruments. Notes of all field work are plotted in the draughting-room, and the rules and regulations for field work and instrument-room must be strictly adhered to. Students must be engaged in the work of a class in the hours set apart for it, otherwise their attendance will not be counted.

I. This course is taken by Second Year students in courses A, B, C, and D. The description, use, adjustment and care of chains, tapes, compasses, levels, transits and minor* surveying equipment. Methods employed in elementary surveying.

The practical work in the field and draughting room is an important part of this course.

Lecture—Fri. 9-10. Mr. Slinn.

Field Work and Draughting—Thurs. 1-4.

Text-book—Raymond, Plane Surveying.

II. This course is taken by Second Year students in courses E, F, and G. It is the same as Surveying I but will also include Railroad Surveying—Curves, curve problems in location, levelling, profiles, elements of switchwork. Topographic Surveying—with stadia, plane table, hand level, and transit and level. Reconnaissance and simple triangulation. Hydrographic Surveying—Methods, sextant, river surveying, stream flow. Laying out of buildings and engineering construction.

Lectures—Mon. 9-10, Thurs. 11-12. Professor Harvey.

Text-book—Raymond, Plane Surveying.

III. This course is taken by Second Year students in courses E, F, and G. It is the practical part of Surveying II and will consist of instrumental surveys carried out in the field and the plotting of these surveys in the draughting room.

The attendance in the field and draughting room as well as the completed notes and plans will be considered in the class standing.

Field and Draughting Room—Wed. 1-4, first term; Thurs. 1-4.

Professor Harvey and Mr. Slinn.

IV. FOR CIVIL ENGINEERING STUDENTS OF THE THIRD YEAR ONLY. Dominion Land Surveying—Comprising the methods adopted in Survey of Dominion Lands, as laid down in Manual of Survey, issued 1903, by the Dominion Government. Provincial Land Surveying.

Geodesy.—Comprising the principles and methods of procedure in extended triangulation. Determination of Latitude, Azimuth, and Time. Angular Levelling.

Mine Surveying.—Principles involved in Mine Surveys, and problems connected with underground work.

Photographic Surveying.—Principles involved. Field work. Mapping

Lecture—Fri. 11-12. Professor Harvey.

Field Work and Draughting—Mon. 10-12.

Text-book:—Johnson and Smith, *Surveying*.

Books of Reference:—Surveys Act, Ontario.

Manual of Survey for D.L.S.

V. FOR CIVIL ENGINEERING STUDENTS OF THE THIRD YEAR. Advanced practical work in Land, Municipal, Railway and Construction Surveying will be given. Problems will be set on Transition Curves, Vertical Curves, Earthwork, Location and lay-out of buildings, culverts, Switch-work. Descriptions of Properties. Separate problems will be given as far as possible. The same regulations govern this as govern Surveying III.

Field Work and Draughting—Tues. 1-4 (a), Sat. 9-12 (b).

Professor Harvey.

VI. FOR STUDENTS IN COURSES A AND C. Dominion Land Surveying—Comprising the methods adopted in Survey of Dominion Lands, as laid down in Manual of Survey, issued 1903, by the Dominion Government. Determination of Latitude, Azimuth and Time.

Ontario Land Surveying.

VII. MINING ENGINEERING. Principles involved in Mine Surveys, and problems connected with underground work.

Topographic Surveying—Extension of work taken in Surveying I.

Lecture—Thurs. 9-10. Professors Harvey and Graham.

Field Work—Thurs. 1-3.

Text-book:—Johnston and Smith, *Surveying*.

Books of Reference:—Surveys Act—Ontario.

Manual of Survey, D.L.S.

ENGINEERING FIELD WORK

The hours shown below are temporary, subject to change and therefore do not correspond with Time-Table at back of Calendar.

The classes in this subject are practical, and enable students to become perfectly familiar with the instruments and take charge of the different departments of Surveying work.

I. Students will be present at the School of Mining at 10 a.m. on the day preceding the Spring Convocation, 1920, to commence Field Work, and must procure the prescribed field book and draughting material. The class will be under canvas for two weeks, receiving full instructions in practical work in Stadia, Hydrographical, Land, Railway and other branches of Surveying II. The class is under camp organization. The tents, army sheets, camp utensils, etc., are furnished by the School. Each student must provide himself with a pair of heavy blankets or other bedding, draughting instruments, note book, detail, profile, cross section, and tracing paper. The expense of provisions, cooks, and personal transport must be borne by the students, an advance of \$20.00 being made to cover same.

Throughout the work, the class will be in the field daily, and in the evenings must complete notes and draught the day's work. All notes and draughting must be completed before leaving camp, for qualification. Students must notify the Secretary of their intention to attend this class not later than March 15th, 1920, so that all arrangements may be completed before the camp opens. Students should also provide themselves with any Engineers' Field Book, Tables of Logarithms, etc., they may be able to procure.

Field Work—Two weeks. Professor Harvey.

ENGINEERING FIELD WORK II.

This work is for Civil Engineering students only and will consist of practical work in Railway Location, Switch Problems, and work connected with Bridge and other Surveys. When weather does not permit of outdoor work, the class will be employed draughting the results of the practical work or working of problems.

Standing is based on term work.

Field Work and Draughting—Sat. 9-12. First term, Professor Harvey.

ELECTRICAL ENGINEERING.

PROFESSOR—L. W. Gill, M.Sc. (on active military service).

ASSISTANT PROFESSOR—E. W. Henderson, B.Sc.

LECTURER—D. M. Jemmett, M.A., B.Sc.

I. FUNDAMENTAL PRINCIPLES. Electro-magnetism and electro-induction. The magnetic circuit. Induction of electric currents. Self and mutual induction. Elementary theory of alternating and direct current generators and motors. Common systems of transmission and distribution of electric current. General principles of illumination. Storage batteries.

For students in courses A.D., E.F.

Lectures—Mon. 9-10; Fri. 9-10 (b). Mr. Jemmett.

Laboratory—See General Engineering III.

II. ELEMENTARY ELECTRICAL ENGINEERING. Electromagnetism and electromagnetic induction. The magnetic circuit. Hysteresis and hysteresis loss. Measurement of magnetic quantities. Effect of temperature and age on the magnetic properties of metals.

The theory construction, and operation of transformers. Elementary theory of direct and alternating current generators and motors.

Lectures—Mon. 11-12, Wed. 9-10, Thurs. 9-10, and 11-12 (second term).

Mr. Jemmett.

Laboratory—Fri. 1-4.

III. ELECTRICAL MEASUREMENTS. Continuous alternating, oscillating and rectified currents. Generated and induced electromotive force. Analysis of complex alternating currents and electromotive forces. Laws governing the flow of current in circuits having resistance, inductance and capacity. Meters and the measurement of electrical quantities.

Lectures—Mon. 9-10, Thurs. 11-12 (a). Fri. 9-10 (b).

Mr. Jemmett.

Laboratory—Tues. 1-3.

IV. Advanced work in drawing, with special attention to design.

Draughting Room—Tues. 3-5, Sat. 9-12. Professor Eaton.

V. ALTERNATING CURRENT SYSTEMS. Theory of alternating current generators. Synchronous and Asynchronous Motors. Rotary Converters. Potential Regulators. Phase changing. Multiphase Systems. Transmission of power. Applications of alternating current in commercial work.

Lectures—Mon. 10-11, Tues. 9-10, Wed. 9-10. Professor Henderson.

Laboratory—Tues. 2-5.

VI. DIRECT CURRENT SYSTEMS. Advanced theory of direct current machines. Series, shunt, and compound generators and motors. Energy losses, and commutation. Efficiency, operation and control of direct current generators and motors. Theory and practical application of storage batteries. Application of direct current in commercial work.

Professor Henderson.

Lectures—Wed. 11-12, Fri. 10-11 (a).

Laboratory—Wed. 2-5; second term.

VII. GENERAL ELECTRICAL ENGINEERING. A special laboratory course for students in Mechanical Engineering.

Laboratory—Mon. 10-12. Professor Henderson.

VIII. ILLUMINATION. Units and Standards of Illumination. Sources of Light. Distribution of Light. Photometers and Measurement of Illumination. Transmission and Distribution of Electric Power for Lighting Purposes.

Lecture—Mon. 1-2, second term. Mr. Jemmett.

Laboratory—Mon. 2-4; second term.

IX. ELECTRIC RAILWAYS. Advantages and Disadvantages of Electric Traction. Electric Motors available for Traction Work. Motor Cars and Electric Locomotives. Methods of Control. Comparison of Characteristics of Steam and Electric Locomotives. Power required for various classes of service. Brakes and Braking. Transmission and Distribution of Power for Traction Purposes.

Lectures—Wed. 10-11, Fri. 9-10 (a). Professor Henderson.

Laboratory—Fri. 1-4; second term.

X. DESIGNING. Design and Calculation of performance of transformers, generators, and motors.

Lectures—Fri. 10-11 (b), 11-12.

Draughting Room—Fri. 1-4. Professor Henderson.

XI. TELEGRAPHY AND TELEPHONY. The Morse System. Repeaters. Duplex and Multiplex Systems. Combination Systems. Automatic and Printing Telegraph. Railway Block Signal Systems. Modern Telephone Systems. Wireless Telegraphy and Telephony. Simultaneous Telegraphy and Telephony.

Lectures—Wed. 10-11, Fri. 9-10 (a). Professor Henderson.

Laboratory—Fri. 1-4.

LABORATORIES OF ELECTRICAL ENGINEERING.

Laboratory No. 1 is equipped with standard types of direct current motors and generators, the motors being provided with a special form of automatic brake for purposes of loading. This laboratory is also equipped with a set of large rheostats which are used for absorbing the output of the various generators when loaded for experimental purposes. A wide range of ammeters, voltmeters, and wattmeters completes the equipment.

Laboratory No. 2 is equipped with alternating current apparatus, including three-phase alternators, rotary converters, single and polyphase induction motors, constant current transformers, series and potential transformers, power transformers with a full complement of rheostats, ammeters, voltmeters, wattmeters, tachometers, etc.

Laboratory No. 3 is equipped with standard electro-dynamometers and voltmeters for calibrating commercial meters; apparatus for

measuring the magnetic properties of the magnetic metals. A motor-generator set supplies current at low voltage for calibrating ammeters, and a second small motor-generator set supplies potential differences up to 500 volts. Two small sets of storage cells supply steady current for low voltage work.

Laboratory No. 4 is provided with a complement of various types of electric lamps; a photometer for measuring illumination, and a Duddell oscillograph for observing potential and current wave forms. A constant current transformer supplies current for a.c. series arc lamps.

This laboratory is also equipped with a complete outfit of wireless apparatus, a central telephone exchange, together with a variety of telephone transmitters and receivers.

The University Power Plant is a combination direct and alternating current system making available for study and observation such apparatus as D.C. generators, synchronous motors, Tirril regulators, balancer sets, storage batteries, power transformers, integrating wattmeters, boosters, switchboard apparatus, etc.

The city of Kingston has a new and up to date hydro-electric station to which visits are made for instruction and observation.

MECHANICAL ENGINEERING.

PROFESSOR—G. L. Guillet, M.Sc.

ASSISTANT PROFESSOR—L. S. Eaton, M.E.

I. ELEMENTS OF MACHINE DESIGN. A brief review of the characteristics of materials used in machine construction. Design of standard types of riveted joints as found in boilers and other pressure vessels. The strength and efficiency of screw threads, and their application to screw fastenings and power transmission. An analysis of the stresses in various types of keys and cotter joints. The design of axles and shafts to withstand various loadings. The proper use of various types of shaft couplings. Theoretical proportions for levers and winch handles. Combined flexure and direct stress as found in screw clamps and punch press frames.

Several examinations are held during the term, and weekly exercises given.

Lectures—Wed. 11-12, 1-2; Fri. 10-12; first term. Professor Eaton.

Text-book—Marks, *Mechanical Engineer's Handbook*.

Required of third year students in courses D, F and G.

II. ELEMENTS OF MACHINE DESIGN. Transmission of power by belt-ing. Friction and lubrication of cylindrical and flat surfaces. Best proportions for journals. Design of plain cylindrical and thrust bearings, together with a brief treatise on bearing metals. Stresses in spur and bevel gear teeth. Dynamics of the reciprocating and rotating parts of a steam engine, including the balancing of these parts. Design of various types of governors.

Several examinations are held during the term, and weekly exercises given.

Lectures—Wed. 11-12, 1-2; Fri. 10-12; second term. Professor Eaton.

Text-book—Marks, *Mechanical Engineer's Handbook*.

Required of third year students in courses F and G.

III. APPLICATION OF WORK TAKEN UP IN MECHANICAL ENGINEERING I and II.

Draughting Room—D, Tues. 1-5; F, Mon. 3-5; Tues. 2-5; Sat. 9-12.

Professor Eaton.

Required of third year students in courses D and F.

IV. THE ELEMENTS OF THE POWER PLANT. Fuels and combustion. Transfer of heat. Heating Surface. Generation of steam. Types of Boilers. Chimneys. Artificial draft. Smoke prevention. Mechanical stoking. Coal Handling. Use of superheated steam. Feedwater heaters. Condensing systems. Pumping machinery. Compressed air. Gas and oil engines. Gas producers.

For third year Mechanical Engineering students and fourth year students in all other courses.

Lectures—Mon. and Thurs. 11-12. Professor Guillet.

V. ADVANCED MACHINE DESIGN. More rigorous treatment of the elements of machine design. Application of the laws of mechanics and kinematics to the design of some machine tool. Analysis and design of simple and multiple expansion steam engines. General theory and salient points in the design and operation of internal combustion engines. Calculations involved in steam turbine design.

Required of fourth year students in Mechanical Engineering.

Lectures—Mon. 9-10, Thurs. 10-11. Professor Eaton.

Draughting Room—Tues. 1-5, Wed. 9-12 and 1-5, Thurs. 1-3.

JIG AND FIXTURE DESIGN. Fundamental principles governing their design. Applications of these principles when used on several types of machine tools. The design of jigs and fixtures for various machine parts.

VI. POWER PLANT. The proportioning and selection of elements their combination in steam power plants to obtain the maximum profit from investment and operation. Theoretical and practical principles governing the design and operation of gas producer plants. Power plant testing methods and apparatus.

Required of fourth year students in Mechanical Engineering.

Lectures—Tues. 10-11, Thurs. 11-12. Professors Eaton and Guillet.

HEATING, VENTILATING AND REFRIGERATOR. Heat losses from buildings. Design of hot air, hot water and steam heating systems. Discussion of refrigerator systems.

Required of fourth year students in Mechanical Engineering.

Lectures—Mon. 8-9; first term. Professor Eaton.

VII. KINEMATICS OF MACHINES. Kinematic links and chains, constrained motion, higher and lower pairing; velocity and acceleration of points in mechanism; quadric, slider, and other crank chains, their inversions and applications to practical machines; instantaneous centres and centrodes; wheel trains; belt drives; the design of gear teeth; power transmission systems, their design and efficiency.

Required of third year students in Course Courses A and E.

Lecture—Wednesday 9-10. Professor Eaton.

VIII. FUEL TESTING LABORATORY. Testing of fuels, gaseous, liquid and solid, with respect of their suitability for power generation. Gas and fuel analysis. Calculation and calorimetric determination of the heating value of fuels. Gas analysis in connection with the operation of steam boilers, gas and gas producers. Physical tests of lubricants. Causes and prevention of boiler scale. Treatment of feedwaters.

Required of fourth year Mechanical and Electrical Engineering students.

Laboratory—F, Sat. 9-12; G, Mon. 1-4. Professor Guillet.

IX. KINEMATICS OF MACHINES. Motion, velocity and acceleration of plane mechanisms. Types of motion and transformation from one type to another. Classification of mechanisms. Quadric and slider crank chains and their inversions. Non-rigid link mechanisms. Circular, cylindrical and plate cams. Friction drives. Gear Wheels. Evolution, outlines of gear teeth, proportions of teeth, spur, bevel, helical, skew, worm, pin, and elliptical gearing. Simple, compound and epicyclic gear trains. Ratchet mechanisms and escapements. Analysis of complex machine mechanisms. Elementary steam engine mechanics.

Lecture—Wed. 9-10.,

Draughting Room—Fri. 10-12. Professor Eaton.

Required of second year students in Courses E, F, and G.

X. WORKS ORGANIZATION AND ACCOUNTING. Organization of the staff; functions of the departments, purchasing methods, stock keeping, methods of remunerating labor, distribution of overhead expense and analysis of production charges, elements of factory accounting, depreciation of plant, selection of equipment and organization of staff for highest efficiency.

Lecture—Saturday 8-9. Professor Guillet.

Required of fourth year Mechanical and Electrical students.

XI. (a) AEROPLANE DESIGN AND CONSTRUCTION.

(b) AUTOMOBILE AND TRACTOR DESIGN AND CONSTRUCTION.

Fourth year students in Mechanical Engineering may select either (a) or (b).

Thurs. 1-2 (a), Mon. 1-2 (b).

Professors Guillet and Eaton.

THERMODYNAMICS

I. Fundamental laws of Thermodynamics. Behaviour of gases under varying conditions. Theory of air compressors and air motors. Properties of steam and elementary theory of the steam engine. Thermal and mechanical efficiency of heat engines. Operation of simple valves and governors. Measurement of power. Elementary theory of gas engines.

Lectures—Tues. and Fri. 9-10 (a). Professor Guillet.

Required of third year students in courses A, D, E, F, G

II. A continuation of Thermodynamics I.

Required of third year students in Courses D, E, F, G.

Lecture—Tues. 9-10 (b). Professor Guillet.

III. Theory of refrigerating machines and systems. Entropy and entropy-temperature diagrams. Superheated steam. Performance of actual

engines. Influence of size, speed, valve gear and ratio of expansion on economy. Steam jackets. Compound and triple expansion engines. Advanced theory of gas and oil engines. Action of steam upon turbine buckets. Flow of steam through nozzles, orifices, and turbine passages. Effects of friction on flow. Types of steam turbines, and their operation.

Lectures—Tues. 11-12, Thurs. 9-10.

Experiments in Thermodynamic Laboratory and local power plants.

Laboratory—Sat. 9-12 (a). Professor Guillet.

Required of fourth year students in Courses F and G.

IV. Advanced Laboratory work for fourth year Mechanical Engineering students.

Laboratory—Fri. 9-12, 1-4. Professor Guillet.

V. VALVES AND VALVE GEARS. Slide, corliss, piston and poppet valves, etc. Valve diagrams. Fixed and reversible valve gears, valve governors, valve operating cams and eccentrics. Lecture work carried on in conjunction with draughting-room exercises and practical valve setting on laboratory apparatus.

Required of third year Mechanical Engineering students.

Lecture—Wed. 2-3.

Draughting Room or Laboratory—Wed. 3-5. Professor Guillet.

THERMODYNAMIC LABORATORY.

The equipment of this laboratory includes an air compressor, gas engine and gas producer, gasoline engines, kerosene engine, centrifugal fans, centrifugal pumps, reciprocating pumps, steam engines, condensers, calorimeters, and dynamometers, together with all the auxiliary apparatus required for making tests and carrying on experimental work. All apparatus is of standard type and latest design.

A considerable part of the practical work in Thermodynamics is done in connection with the central heating and power plant, which affords exceptional advantages for carrying on experimental work, having been designed with due regard to this purpose.

Every year extensive tests are undertaken of commercial power plants located in Kingston and vicinity, and it is believed that this is a specially valuable feature of the course.

DRAWING.

LECTURER—A. M. Squire, B.Sc.

The hours shown below are temporary, subject to change and therefore do not correspond with Time-Table at back of Calendar.

I. The lectures and practical work are arranged with the view of preparing the student for the subjects of Mechanical Drawing. Descriptive Geometry, etc., in the different branches of Engineering.

Each student at the opening of the term must provide himself with a set of drawing instruments of approved standard.

The class standing will be determined by the term's work.

The work will consist of (a) Free-hand lettering adapted to working drawings; (b) Projection Drawing, including intersections and developments; Simple working drawings.

Sections a, b, c Thur. 1-4, Sat. 9-11; sections d, e, f, Mon. 3-5, Wed. 1-4. Mr. Squire.

Text:—Reinhardt, *Lettering*.

II. The work will include detailing from assembled drawings, making assembled drawings from detail drawings and from free-hand sketches of details of machines, tracing and blue-printing.

The class standing is determined by the term's work.

Courses A.C, B.D. Mon. 1-4.
Mr. Squire.

III. A more extended course than as outlined in Drawing II.

The class standing is determined by the term's work.

Courses E, F, G, Tues. 1-4, and Wed. 1-4(b). Mr. Squire.

DESCRIPTIVE GEOMETRY

The hours shown below are temporary, subject to change and therefore do not correspond with Time-Table at back of Calendar.

Division of Space into four quadrants. Orthogonal projection of a point in the four quadrants. Orthogonal projection of a line in all the quadrants. Parallel-perspective representations of points and lines in all the quadrants. True length of a line. Traces of lines and planes. Intersecting lines and planes. Representations of infinite planes. Inter-

section of a line and a plane; intersection of two and more planes. Perpendicular to a plane. Inclination of a plane to the horizontal and vertical planes of projection. Rotation of planes about a fixed axis. Parallel planes; distance between them. Perpendicular to a line in general. Common perpendicular to any two lines in space. Intersection of solids.

Generalization of different modes of projection by introducing central projection. Its application to perspective representation in one plane. Conception of the horizon as the locus of intersection of all parallel horizontal lines. Perspective representations of solids bounded by planes.

Central projections as applied to shadows thrown by lines, definite planes and solids. Shades and shadows of cones, pyramids, spheres, etc., on one, two or more planes, when the source of light is at an infinite distance.

Intersection of curved surfaces.

The students are drilled in the subject by numerous applications in the draughting room.

Sections a, b, c, Fri. 1-4, sections d, e, f, Tues. 1-4. Mr. Squire.

Text-book—Millar, *Descriptive Geometry*.

SHOP WORK.

INSTRUCTORS—A. C. Baiden, Machine Shop.

.....Blacksmith Shop.

....., Pattern Shop.

Students in all courses will be given a course of practical work in the workshops of the School as per schedule of courses.

Students in courses F and G shall enter any commercial works approved by the School and take a special course of shop training extending over a period of thirty-six weeks (18 weeks between second and third, and 18 weeks between third and fourth college years; or, in case accommodation can not be secured, they shall attend a special course in the workshops of the School, extending over a period of 8 weeks (4 weeks preceding their third college year and 4 weeks preceding their fourth college year).

A student in Course H shall enter any commercial works approved by the school and take a special course of shop training extending over a period of 12 weeks, between the second and third years of his course.

To ensure that as many students as possible will have an opportunity to obtain their shop training in commercial works, arrangements have been made with the management of several of the large manufacturing establishments, so that the students who have completed their second year, may enter upon a suitable course of shop training and receive such remuneration as will more than cover their expenses. In this case the student must present a certificate from the manager of the works in which he has carried out his practical work, stating the character of the work done and the amount of time spent in the various departments.

A complete forge shop has been added to the equipment, so that now efficient instruction can be given in machine shop practice, and in blacksmithing. The forge shop is located in the basement of the workshop building, and is equipped with the latest types of down-draft forges, and electric drive for the blower and exhauster.

Course D, 3rd Year, Wed. 2-5. Courses E, F and G, 2nd Year, Sat. 9-12. Course F, 3rd Year.

PHYSICAL TRAINING.

PHYSICAL DIRECTOR—Lieut. Jas. G. Bews.

The Gymnasium is a modern stone building 60 ft. x 105 ft., including in its equipment a plunge bath, shower baths, steel lockers, drying rooms, and running track.

Physical training is taken as a class by all first year students for two hours each week. Voluntary classes are offered for others.

Students are first examined by the University Physician, who is a member of the medical staff. Where necessary special exercises are prescribed to correct any physical defects found by such examination.

Physical Drill.—A progressive series of exercises with dumb bells, Indian clubs, bar bells, and chest weights, combined with marching tactics and free setting-up exercises. Apparatus work on long horse, parallel bars, tumbling, ladder and horizontal bar. Special attention given to each individual case.

Basketball, indoor baseball, boxing, wrestling, fencing, swimming, running, etc., are arranged for.

Credit is given for participation in the practices of the various athletic teams on an hour for hour basis; such attendance at practice must be certified to the Physical Education Committee of Senate by the captains of those teams according to regulations prescribed by that committee.

A time-table will be posted in the Gymnasium at the beginning of the session.

LIBRARIES.

Each department of the School of Mining has a departmental library in which the books and periodicals specially related to the subject of the department are kept, and where they can be consulted. There is thus a separate library for physics, chemistry, mining and metallurgy, geology and mineralogy, general and civil engineering, and mechanical and electrical engineering. This arrangement facilitates the consultation of books in the building in which they are most useful. In some cases where a book is much used in more than one department, duplicate copies are provided.

The books are catalogued in card catalogues and numbered in such a way as to be readily accessible. Students have the greatest freedom in the use of books and journals, which they may take home under conditions easily complied with, varying slightly in the different libraries.

Books to which students constantly refer in any one branch of their work are for the most part kept in the laboratory or room in which the work is carried on. For example, books in quantitative chemical analysis which are most frequently consulted are placed on a shelf in the quantitative laboratory.

The library of the geology department receives geological survey reports from Britain and nearly all of the British colonies, from the federal government, and the greater number of the United States, and from several other foreign countries.

Students in Applied Science have access, not only to the departmental libraries, but also to the central library of Queen's University which contains upwards of 50,000 volumes. Besides the card catalogue of books there is an extensive card catalogue of important articles in the leading periodicals in the possession of the library.

The following periodicals are on file in the various libraries :

DEPARTMENT OF CHEMISTRY.

Analyst.
Arms and Explosives.
Annual Reports of the Chemical Society.
Berichte der deutschen chemischen Gessellschaft.
Board of Trade Labour Gazette.
Bulletin Bureau of Standards.
Bulletin of Labour (U.S.).
Canadian Chmical Journal.
Canadian Labour Gazette.
Chemical Abstracts.
Chemical Engineering and The Works Chemist.
Chemical and Metallurgical Engineering.
Chemical News.
Chemisches Centralblatt.
Experiment Station Record.
Forestry Quarterly.
Helvetica Chimica Acta.
Inland Revenue Bulletin.
Journal of the American Chemical Society.
Journal of the Association of 'Official Agricultural Chemists.
Journal of Biological Chemistry.
Journal of the Chemical Society.
Journal of Industrial and Chemical Engineering.
Journal of the Institution of Petoleum Technologists.
Journal of Physical Chemistry.
Journal of the Society of Chemical Industry.
Jahrbuch der Elektrochemie.
Jahresbericht über die Fortschritte der Chemie.
Jahresbericht über chemischen Technologie.
Kolloid-chemische Beiheft.
Kolloid-Zeitschrift.
Liebig's Annalen.
Nature.
Proceedings of the Chemical Society.

Pulp and Paper Magazine.
Pure Products.
Recueil des Travaux Chimiques des Pays-Bas.
Science.
Science Progress.
Transactions of the American Institute of Chemical Engineers.
Transactions of the American Electrochemical Society.
Transactions of the Faraday Society.
Zeitschrift für analytische Chemie.
Zeitschrift für angewandte Chemie.
Zeitschrift, für physikalische Chemie.
Zeitschrift für Elektrochemie.
Zeitschrift für das gesammte Schiess u. Sprengstoff Wesen.

DEPARTMENTS OF ELECTRICAL AND MECHANICAL ENGINEERING.

Aeronautics.
American Machinist.
American Convention Electrical Railway Reports.
Automobile Engineer.
Applied Science (Toronto University).
Bulletin Bureau of Standards.
Canadian Electrical News.
Canadian Machinery.
Canadian Patent Office Record.
Compressed Air Magazine.
Electric Journal.
Electrical Review.
Electrical World.
Electrician.
Engineering (London).
General Electric Review.
Industrial Management.
International Marine Engineering.
Journal of the Western Society of Engineers.
Journal of the Society of Automotive Engineers.
Machinery.
Mechanical Engineer.
Motor Age.
Official Journal of Patent (Great Britain).
Proceedings of the American Gas Institute.
Proceedings of the National District Heating Association.
Railway Age Gazette.
Science Abstracts, Pt. B.
Transactions of the American Institute of Electrical Engineers.
Transactions of the American Society of Mechanical Engineers.

DEPARTMENT OF CIVIL ENGINEERING.

Canadian Engineer.
Canadian Railway and Marine World.
Concrete and Constructional Engineering.
Contract-Record.
Engineering-Contracting.
Engineering News-Record.
Journal of the Engineer's Club of St. Louis.
Journal of the Engineering Institute of Canada.
Massachusetts State Board of Health Reports.
Minutes of Proceedings of the Institution of Civil Engineers.
Municipal Engineering.
New York State Board of Health Reports.
Ohio State Board of Health Reports.
Proceedings of the American Society of Civil Engineers.
Proceedings of the Engineers' Society of Western Pennsylvania
Professional Memoirs, Washington Barracks, D.C.
Railway Age Gazette.
Transactions of the Canadian Society of Civil Engineers.

DEPARTMENT OF MINING AND METALLURGY.

Canadian Mining Journal.
Chemical and Metallurgical Engineering.
Chamber of Mines, West Australia Monthly.
Coal Age.
Conservation Commission Reports.
Engineering and Mining Journal.
Geological Survey Reports.
Internationale Zeitschrift für Metallographie.
Iron Age.
Journal of the Chemical and Metallurgical Society of S. Africa
Journal of the Iron and Steel Institute.
Mines Department Reports.
Mining Magazine.
Mining and Scientific Press.
Proceedings of the Colorado Scientific Society.
Quebec, Ontario and British Columbia Bureau of Mines Reports.
Revue de Metallurgie.
School of Mines Quarterly.
The Engineering Index.
The Mining American.
The Northern Miner.
Transactions of the Institute of Mining and Metallurgy.
Transactions of the Institution of Mining Engineers.

Transactions of the American Institute of Mining Engineers.
Transactions of the Lake Superior Mining Institute.
War Dept., Chief of Engineers, Reports, Washington.

DEPARTMENT OF PHYSICS.

Astrophysical Journal.
Annalen der Physik.
Journal de Physique.
Philosophical Magazine.
Physical Review.
Physikalische Zeitschrift.
Proceedings of the Cambridge Philosophical Society.
Science Abstracts Pt. A.

DEPARTMENTS OF GEOLOGY AND MINERALOGY.

American Journal of Science.
American Mineralogist.
Economic Geology.
Geologisches Centralblatt.
Geological Magazine.
Journal of Geology.
Journal of the Geological Society.
Proceedings of the Geological Society of America.
Tashermak's mineralogische und petrographische Mitteilungen.
Zeitschrift für praktische Geologie.
Zeitschrift für Krystallographie.

ENGINEERING SOCIETY.

The representative student organization of the Faculty of Applied Science is the Engineering Society.

This society exists for the purpose of dealing with all matters concerning its members. All students registered in the Faculty of Applied Science are members of the society.

Routine matters of business are transacted by the Executive Board of the society at monthly meetings. The Board makes a full report to the regular meetings of the society.

Regular meetings are held monthly, at which matters of interest pertaining to the society are discussed. The society has been very fortunate, in recent years, in securing successful engineers to address the students during the session. These lectures are always interesting and their importance cannot be too strongly emphasized. The first year students especially should avail them-

selves of every opportunity afforded them to become acquainted with the leading men in the various professions. Any student member who wishes to read a scientific paper before the society will always find the executive of the Engineering Society ready and willing to arrange a date. Prizes are offered in connection with such student papers.

It is through this student society that the conduct of the Science students is regulated. The "Vigilance Committee, which acts as the "court," has one or more sittings a year, when all offenders against written or unwritten laws are dealt with. This Vigilance Committee is directly responsible to the Engineering Society, and its officers are elected yearly.

There is also "The Athletic Committee", which attends to all athletic affairs of the Science students.

The Engineering Society and the graduates and alumni issue an Annual Proceedings. This publication contains a complete list of all the graduates, list of all students registered in the Science Faculty and contains a record of all matters in connection with the Engineering Society. In connection with this department is an Information Bureau, whose object is to assist the graduates, as far as possible, in securing suitable positions. All inquiries and applications should be made to the Editor, G. J. MacKay, Nicol Hall.

The Society conducts a "Technical Supplies Department," where all books prescribed, stationery, note books, drawing paper and instruments, and all other supplies, may be purchased at prices but slightly over cost. Any books not in stock may be ordered and will be secured by the department on payment of a small deposit.

The Society conducts an Annual Dinner, at which members of the Faculty and prominent engineers and business men are invited to give addresses. These "Science Dinners" have always been very successful and are of great value in bringing together the undergraduates and prominent and successful leaders of the profession. An annual dance is also conducted by the society.

The officers of the Engineering Society Executive Board for 1918-19 are as follows:

Hon. Pres., Professor S. N. Graham, B.Sc.; President, T. A. Sims; 1st Vice-President, T. Imbleau; 2nd Vice-President, C. E. Baltzer; Secretary, M. C. Fleming; Asst. Secretary, A. R. Garrett; Treasurer, C. A. Poynton; Editor-in-Chief, G. J. MacKay, B.Sc.; 4th Year Representative, A. M. Mills; 3rd Year Representative, G. D. McLeod; 2nd Year Representatives, C. S. Finkle, C. E. Cobb, D. K. Rosenfield; 1st Year Representatives, H. R. Meyers, H. E. Searle, A. B. McKechnie.

Vigilance Committee—Senior Judge, T. Imbleau; Junior Judge, C. A. Poynton; Sr. Pros. Attorney, O. S. Luney; Jr. Pros. Attorney, J. S.

Stauffer; Clerk, H. J. Rowley; Sheriff, C. W. Knowles; Chief of Police, H. L. Goodearle; Constables, C. M. Moore, G. D. McLeod, H. R. Sills, W. Beer; Crier, D. O. Notman.

Athletic Committee—Hon. Pres., Professor M. B. Baker, B.A., B.Sc., F.G.S.A.; President, G. L. McKenzie; Vice-President, L. H. De LaFranier; Sec.-Treas., R. M. Disher. Representatives: '19, T. A. Sims; '20, R. J. Young; '21, C. S. Finkle; '22, H. H. Bleakney.

NO. 5 FIELD COMPANY CANADIAN ENGINEERS

At the time of writing little is known concerning the future status of the units comprising the Canadian Militia. Some reorganization will likely be effected when all the overseas men return and the country settles down to normal.

This Engineering Company was composed of members of the staff and student body of the Science Faculty of the University. The following roll of officers is taken from the "Militia List" of July, 1918:

5TH FIELD COMPANY

M.D. No. 3

(Organized G.O. 1 Apr. '10)

Headquarters—Kingston, Ont.

Major

Macphail, A., D.S.O. (E)	27 Apr. '14
Malcolm, L. (E)	19 Jan. '15
Wilgar, W. P., D.S.O. (E)	1 Nov. '15

Captain

Ellis, D. S. (E)	1 Nov. '15
Henderson, E. W.	1 Nov. '15

Lieutenants (4)

Sterne, E. T.	15 Mar. '15
	(temp. capt. 11 Apr. '16)
	(seconded 11 Apr. '16)
Manhard, W. E., D.S.O. (E)	17 Aug. '14
	21 Apr. '06
Earnshaw, P., M.C. (E)	19 Aug. '14

Goodwin, W. M., M.C. (E)	17 May '15
	(seconded 14 Sept. '15)
Bird, F. G., M.C. (E)	1 July '15
Slinn, W. H.	17 Jan. '16
Ramsay, J. H., M.C. (E)	1 Feb. '16
Fraser, C. E. (E)	18 Feb. '16
Marshall, I. M. (E)	18 Feb. '16
Martin, J. S.	17 Mar. '16
Parrott, J. R. (E)	18 Mar. '16
Bews, J. G.	23 Mar. '16
Scott, T. S.	19 Apr. '16
	(temp. capt. 3 May '18)
Cadenhead, A. F. G.	3 May '16
	(seconded 1 June '16)
Smail, H. A.	17 June '16
McCarthy, F. W. (f.c.)	17 Aug. '16

Medical Officer

Kidd, G. E., M.C., Capt. A.M.C. (E)	11 Apr. '14
---	-------------

5TH TELEGRAPH DETACHMENT

(Organized 1 April, '10).

The (E) in above list indicates "C.E.F.", the (f.c.) "flying corps." Of the others Capts. Henderson and Scott and Lt. Martin served on the Depot Company at Barriefield Camp. Capt. Sterne and Lt. Cadenhead served with the Imperial Munitions Board. Lt. Bews was instructor for M.D. 3 in Bayonet Fighting and Physical Training. Lt. Smail was in the office of the Paymaster M.D. 3. Lt. Slinn acted as assistant to the C.R.C.E. M.D. 3. So that every officer of the company was actively engaged in military service during the war.

Overseas Record.

The rank given above is that which the overseas officers held before leaving Canada. As C.E.F. officers most of them have gained ranks higher than those given in the Militia List. Also many men who were formerly N.C.O.'s and Sappers now hold C.E.F. commissions. The honours and distinctions which these men have won are many and are a pleasing tribute to their worth and devotion to duty.

The following is a list of C.E.F. officers who were at one time connected with the company as officers or sappers. Apologies are due to any who may be omitted or whose rank or distinction may not be as listed. Lack of full information may have led to some omissions.

- Lt.-Col. A. Macphail, C.M.G., D.S.O. Lt. F. A. Brewster, M.C.
 Mentioned in despatches. Lt. R. F. Clarke, M.C.
 Lt.-Col. W. L. Malcolm. Mentioned Lt. H. Dunlop, M.C.
 in despatches. Lt. D. J. Emery, M.C.
 Major W. P. Wilgar, D.S.O. Men- Lt. C. B. Ferris, D.C.M., Croix de
 tioned in despatches. guerre.
 Major P. Earnshaw, D.S.O. Men- Lt. D. N. McCallum, M.C.
 tioned in despatches. Lt. J. M. McIlquham, M.C.
 Major D. S. Ellis, D.S.O. Men- Lt. D. M. Jemmett, D.C.M.
 tioned in despatches. Lt. A. U. Meikle, M.C.
 Major W. E. Manhard, D.S.O. Lt. J. H. Ramsay, M.C.
 Mentioned in despatches. Lt. L. G. Smith, M.C.
 Major R. D. Harkness, D.S.O., M.C. Lt. A. C. Young, M.C. Mentioned
 Mentioned in despatches. in despatches.
 Major G. E. Kidd, M.C. Lt. J. W. Dougherty, M.M.
 Major E. H. Birkett, M.C. Lt. C. R. Hagey. Mentioned in de-
 *Major W. F. Battersby, M.C. spatches.
 Major J. P. Harvey, M.C. Lt. C. H. MacLaren. Mentioned in
 Major L. W. Gill. despatches.
 Major J. Aird. *Lt. C. C. Scott, M.M.
 Capt. E. A. Baker, M.C., Croix de Lt. N. G. Stewart.
 guerre. Lt. E. Smythe.
 *Capt. H. S. Baker. Mentioned in Lt. W. H. Ellis.
 despatches. Lt. H. T. Eaton.
 Capt. C. B. Bate, M.C., D.C.M. Lt. F. M. Wood.
 Capt. C. S. Craig, M.C. *Lt. W. S. Laing.
 Capt. D. F. Dewar, M.C. Lt. E. G. Sirvage.
 Capt. R. L. Dunsmore, M.C. Lt. J. D. Calvin.
 Capt. H. B. Free, M.C. Lt. C. E. Fraser.
 Capt. W. M. Goodwin, M.C. Lt. D. C. Spears.
 Capt. R. A. Bolton, M.M. Lt. I. M. Marshall.
 Capt. H. C. Haryett, Croix de Lt. L. B. Adams.
 guerre. Mentioned in de- Lt. F. H. McCullough.
 spatches. Lt. H. L. Scott.
 Capt. K. P. MacPherson. Men- Lt. B. L. Irwin.
 tioned in despatches. Lt. L. R. Calder.
 Capt. H. B. Tett. *Lt. W. S. Earle.
 Capt. W. C. Rogers. Lt. H. Harris.
 Capt. O. Alyea. Lt. E. D. Sliter.
 Capt. J. B. MacPhail. *Lt. J. H. Patton.
 Capt. J. R. Parrott. Lt. E. D. Eliter.
 Capt. D. G. Anglin. Lt. J. B. Wilkinson
 Capt. R. M. Calvin. Lt. J. B. Hanlon.
 Lt. F. G. Bird, M.C. Lt. H. Ryan.

Lt. C. V. Lawrence.

*Lt. J. G. Smith.

Lt. D. W. Bews.

Lt. F. L. Brinkman.

Lt. I. F. Kinnard.

Lt. W. C. Miller.

Sgt. C. H. Donnelly. Mentioned in
despatches.

*Corp. H. S. Marlatt, M.M.

*Corp. W. J. Stewart.

*Corp. H. S. Minnes.

*Corp. W. C. Buchanan.

*Died or killed in action.

QUEEN'S Y. M. C. A.

When a student arrives at Kingston to attend the School of Mining he should look for the Queen's Y. M. C. A. corps of guides, which meet every train, at the opening of the term. Each guide wears a streamer of the University colours and will do all in his power to find a comfortable room and a good boarding house for every student. These guides, who are students in attendance at the University, give this service without remuneration, and can be depended on to give trustworthy advice.

Under the supervision of the Science representative on the "Y" Membership Committee, each Science man will be looked after during the year by a student of this Faculty and given any advice he may desire.

As the freshmen are the ones to whom all societies must look for members to continue their work, the "Y" opens a large field by first entertaining all the first-year students in the University at the Freshman's reception and Stag Social, in conjunction with the Queen's Y. W. C. A., where each student is given the opportunity of meeting the students of all faculties; then their work along religious, social and boys' work lines is open to any who have an interest in them.

The Y. M. C. A. reading room in the Old Arts Building is always open to men, and here the Y. M. C. A. President can be consulted on any matters concerning which information is needed.

The Y. M. C. A. have meetings in Convocation Hall at 5 p.m. Wednesdays, when subjects of interest to all faculties are taken up.

Support the "Y" as well as your own faculty societies.

GRADUATES.

In the list are included graduates in the Faculty of Applied Science (B.Sc. and M.E.) and those graduates in Arts (B.A., M.A. and D.Sc.) since 1887, who after graduation have devoted themselves to scientific pursuits.

Graduates will confer a favor by forwarding changes of address to the Secretary.

†Honour standing, granted since 1909 (see page 27).

Name	Date of Graduation.	Address.
Adam, L. R., B.Sc.	1913..	(Deceased).
Agassiz, W. G. S., B.Sc.....	1909..	care Prof. Gwillim, Kingston, Ont.
Ahern, F. X., B.Sc.	1914..	159 Maple Ave., Quebec, Que.
Aird, J. K. W., B.Sc.	1914..	Imperial Oil, Ltd., Halifax, N.S.
Akins, J. R., B.Sc.....	1907..	St. Catharines, Ont.
Alder, W. R., B.Sc.....	1907..	Prescott, Ont.
Allan, F M., B.Sc.	1915..	247 Gloucester St., Ottawa, Ont.
Allin, M. C., B.Sc.	1907..	Whitby, Ont.
Anderson, A. K., B.Sc.....	1913..	52 Patterson Ave., Ottawa, Ont.
Anglin, D. G., B.Sc.....	1911..	52 Earl St., Kingston, Ont.
Anson-Cartwright, R. H. M., B.Sc...	1904..	34 Dundonald St., Toronto, Ont.
Armstrong, W. B., B.Sc.....	1911..	Dept. of Interior, Ottawa.
Arthur, A. J., B.Sc.....	1910..	209 University Ave., Toronto, Ont.
Asselstine, Burton, B.Sc.....	1911..	42 North Front St., Belleville, Ont.
Asselstine, C. V., B.Sc.....	1912..	R.R. No. 2, Odessa, Ont.
Asselstine, R. M., B.Sc.....	1913..	Collins' Bay, Ont.
Aykroyd, M. J., B.Sc.....	1913..	310 Lumsden Bldg., Toronto, Ont.
Bailie, A. A., B.Sc.....	1906..	Billings Bridge, via Ottawa.
Baker, C. W., B.Sc.....	1905..	50 Garfield Ave., S., Hamilton, Ont.
Baker, H. S., B.Sc.....	1902..	52 North Main St., Niagara Falls, Ont.
Baker, H. S., B.A., '12; B.Sc.....	1914..	(Died of wounds).
Baker, J. C. B.Sc.....	1903..	Kingston, Ont.
Baker, E. A., B.Sc.	1915..	Ottawa, Ont.
Baker, M. B., B.A., B.Sc.....	1902..	Professor, Geology, Queen's University, Kingston.
Baker, Wm. C.; M.A.....	1895..	Associate Professor of Physics, School of Mining, Kingston.
Ball, A. N., B.Sc.....	1914..	Grenfell, Sask.
Barrett, W. G., B.Sc.....	1916..	227 Laurier Ave. W., Ottawa.
Bartlett, J., B.Sc.....	1907..	267 University Ave., Kingston.
Bartlett, R., B.Sc.	1912..	267 University Ave., Kingston.
Bateman, A. M., B.Sc.....	1910..	707 Orange St., New Haven, Conn.

Name	Date of Graduation.	Address.
Bateman, G. C., B.Sc.....	1905..	100 Indian Road, Toronto.
Bates, H. C., B.Sc.	1917..	358 Markham St., Toronto.
Battersby, W. F., B.Sc.....	1910..	(Deceased).
Beer, H. L., B.Sc.....	1914..	400 Richmond St., W., Toronto.
Bell, F. A., B.Sc.	1910..	81 Elm St., St. Thomas, Ont.
Bell, James M., M.A.....	1899..	Burnside, Almonte, Ont.
Bell, J. W., B.Sc.....	1913..	Corbin, B.C.
Bell, W. A., B.Sc.....	1911..	Box 1067 Yale Sta., New Haven.
†Benger, W. F. A., B.Sc.	1913..	Port Arthur, Ont.
Bennett, Joseph, B.Sc.	1911	
Berney, K. C., B.Sc.....	1906..	Westinghouse Co., Hamilton, Ont.
Berry, H. F., B.Sc.....	1912..	1001 Rogers Bldg., Vancouver, B.C.
†Bertram, A. S., B.Sc.....	1912..	Killed in action.
†Bertram, H. G., B.Sc.....	1910..	Dundas, Ont.
Bews, D. W., B.Sc.....	1914..	Gananoque, Ont.
Bick, A. H., M.A., 1913; B.Sc.	1915..	138 Bank St., Ottawa, Ont.
Bird, F. G., B.Sc.....	1914..	Westboro, Ont.
Birkett, E. H., B.Sc.....	1910..	Kingston, Ont.
†Blackburn, A. P., B.Sc.	1917..	Box 146, Chatham, Ont.
Blenkhorn, S., B.Sc.....	1909..	Canning, N.S.
Bogart, J. L. H., B.Sc.....	1903..	Militia Department, Ottawa.
Boggs, O. D., B.Sc., 1916; M.Sc....	1918..	Cobourg, Ont.
Bolton, G. E., B.Sc.....	1912..	322 W. Park St., Anaconda, Mont. tana, U.S.A.
Bolton, L. L., M.A., B.Sc.....	1906..	Dept. of Mines, Ottawa, Ont.
Bolton, R. A., B.Sc.....	1914..	Strathroy, Ont.
Bonham, J. C., B.Sc.	1915..	Balkan Mining Co., Bovey, Minn.
†Borden, Perry A., B.Sc.....	1911..	Hydro-Electric Commission, Conti- nental Life Bldg., Toronto.
†Bothwell, N. D., B.Sc.....	1911..	Perth, Ont.
Boughner, J. W., B.Sc.....	1914..	200 Wellington St., St. Thomas, Ont.
Boulton, C. A., B.Sc.	1917..	Box 1245, Saskatoon, Sask.
Bourgoing, S. B.Sc.	1912..	Tadousac, Que.
Bowen, N. L., M.A., '07; B.Sc., '09; Ph.D.	1912..	Prof., Queen's University, Kingston.
Boyd, C. S., B.Sc.	1917..	Uxbridge, Ont.
†Bradley, H., B.Sc.	1911..	107 Gloucester St., Ottawa.
Brebner, K. A., B.Sc.....	1914..	680 Princess St., Kingston, Ont.
Brewster, F. A., B.Sc.....	1909..	Banff, Alta.
Brewster, J. A., B.Sc.....	1911	
†Brinkman, F. L., B.Sc.	1917..	168 Montreal St., Kingston.
Brock, R. W., M.A.....	1895..	Univ. of B.C., Vancouver, B.C.
Brown, E. W., B.Sc.	1908..	Clareshom, Alta.
Brown, E. F., B.Sc.	1915..	100 Second Avè., Ottawa, Ont.

Name.	Date of Graduation.	Address.
Browne, D. G., B.Sc.	1915..	104 Gates Ave., Montclair, N.J.
Browne, P. J., B.Sc.	1909..	(Deceased).
Brown, T. S., B.Sc.	1904..	Hawkesbury, Ont.
†Bruce, E. L., B.A., B.Sc.	1909..	Dept. of Mines, Ottawa.
Buchanan, W. C., B.Sc.	1914..	Deceased.
Bunker, G. N., B.Sc.	1914..	Customs Dept., Ottawa, Ont.
†Burdekin, R. W., B.Sc.	1913..	Gouverneur, N.Y.
Burnham, D. W., B.Sc.	1914..	Cobourg, Ont.
Burns, S. L., B.Sc.	1914..	Hawkesbury, Ont.
†Burroughs, C. W., B.Sc.	1911..	Riorden Pulp Mills, Quebec, Que.
Burrows, A. G., M.A., B.Sc.	1902..	Bureau of Mines, Toronto.
Burrows, M., B.Sc.	1912..	Riorden Pulp Factory, Quebec, Que.
Buskard, C. H., B.Sc.	1914..	Belleville, Ont.
Butler, S. H., B.Sc.	1910..	Regina, Sask.
Cairns, D. D., B.Sc., '05; M.E., '06		
Ph.D.	1910..	(Deceased).
Calhoun, D. H., B.Sc.	1915..	(Died of wounds).
Callander, R., B.Sc.	1910..	58 Cooper St., Ottawa.
Calvin, J. D., B.A., B.Sc.	1907..	Kingston, Ont.
Calvin, R. M., B.Sc.	1914..	Kingston, Ont.
Cameron, G., B.Sc.	1912..	Tech. School, Hamilton, Ont.
Cameron, J. G., B.Sc.	1914..	Finch, Ont.
Campbell, A. S., B.Sc.	1907..	Civil Engineer, Kingston, Ont.
Campbell, T. D., B.Sc.	1909..	Perth, Ont.
Campbell, W. M., B.Sc.	1909..	(Deceased).
Cantelo, R. C., B.Sc.	1913..	Dept. of Mines, Ottawa.
Carmichael, A. D., B.Sc.	1914..	Bruce Mines, Ont.
Carmichael, J. E., B.Sc. '09; M.D. 1911..		302 Jasper Ave. E., Edmonton, S., Alta.
Carnochan, R. K., B.Sc.	1916..	18 James St., Ottawa, Ont.
Carscallen, H. A., B.Sc.	1911..	Enterprise, Ont.
Carr-Harris, A. A., B.Sc.	1906..	10 Lake St., St. Catharines, Ont.
Cartwright, C. T., B.Sc. '05; M.E. 1911..		(Deceased).
Caton, W. C., B.Sc.	1912..	Bulletin Office, Edmonton, Alta.
Caverhill, A. J., B.Sc.	1911..	R.R. 1, Ilderton, Ont.
Caughy, J. E., B.Sc.	1913..	1st Ave. N.W., Calgary, Alta.
Cavers, T. W., B.Sc.	1904..	Copperhill, Tenn., U.S.A.
Chalmers, G. H., B.Sc.	1918..	Smith's Falls, Ont.
Charters, D. E., B.Sc.	1915..	Ottawa, Ont.
Chartrand, D. E., B.Sc.	1909..	Topographical Survey, Ottawa.
†Clarke, K. S., B.Sc.	1910..	Coniston, Ont.
Code, E. S., B.Sc.	1907..	1400 Alaska Bldg., Seattle, Wash.
Code, L. B., B.Sc.	1906..	2206 8th Ave. E., Vancouver, B.C.
Collins, E. A., B.Sc.	1905..	Copper Cliff, Ont.

Name	Date of Graduation.	Address.
Connell, F. M., B.Sc.....	1906..	Royal Bank Bldg., Toronto.
Cook, W. E., B.Sc.....	1912..	308 Albert St., Kingston.
Cook, W. S., B.Sc.	1915..	116 Lyon St., Ottawa, Ont.
Cooper, R. H., B.Sc.....	1909..	Pub. Works Dept., Port Arthur, Ont.
Cordukes, J. P., B.Sc.....	1908..	Topographical Survey, Ottawa.
Corkill, E. T., B.Sc. '04, M.E....	1905..	Copper Cliff, Ont.
Craig, H. B. R., B.Sc.....	1903..	Fort William.
Craig, J. D., B.A. '97, B.Sc.....	1900..	593 Besserer St., Ottawa, Ont.
Cram, R. M., B.Sc.....	1913..	Westboro, Ont.
Crawford, V. W., B.A. '09, B.Sc..	1910..	Kingston, Ont.
Cross, J. G., B.Sc.....	1913..	Port Arthur, Ont.
Cumming, Alfred L., B.Sc.	1905..	R. 3, Victoria Block, Edmonton, Alta.
Cummings, A., B.Sc.	1908..	Box 163, Fernie, B.C.
Currie, P. W., B.Sc.....	1900..	92 Argyle St., Ottawa.
Curtin, C. J., B.A. '05, B.Sc....	1907..	Brockville, Ont.
Dagenais, J. H., B.Sc.....	1916..	Morewood, Ont.
Daley, J. C., B.Sc.....	1909..	112 S. Hoyne Ave., Chicago, Ill.
Dallyn, H. A., B.Sc.....	1914..	183 Talbot St., St. Thomas, Ont.
†Daly, F. G., B.Sc.....	1914..	(Deceased).
Dalziel, W., B.Sc.....	1913..	Imperial Munitions, Ottawa.
Danais, P., B.Sc.	1917..	Baie St. Paul, Que.
Davidson, R. E., B.Sc.....	1914..	Cobourg, Ont.
†Davis, N. B., B.Sc.....	1911..	O'Brien Ltd., Union Bank Bldg, Ot- tawa, Ont.
Dawson, S. G., B.Sc.....	1912..	149 Patterson Ave., Ottawa, Ont.
Dawson, W. L., B.Sc.....	1913..	149 Patterson Ave., Ottawa.
Dempster, H. O., B.Sc.....	1908..	Pacific Bldg., Vancouver, B.C.
Dennis, E. M., B.Sc.....	1904..	Dept. of Interior, Ottawa.
†Denovan, R. A., B.Sc.....	1914..	Dalkeith, Ont.
Denyes, W. B., B.Sc.....	1916..	Creighton Mine, Ont.
Dewar, D. F., B.Sc.....	1912..	No. 5 Field Co. Engineers, Kingston
Dick, H. S., B.Sc.....	1913..	Kingston, Ont.
Dillabough, J. V., B.Sc.....	1905..	The Pas, Man.
Dobbs, G. G., B.Sc. '06, M.E....	1908..	Box 97, Bessemer, Alabama, U.S.A.
Dobson, J. V., B.Sc.....	1910..	Picton, Ont.
Donevan, F. J., B.Sc.....	1916..	R.R. No. 3, Lansdowne, Ont.
Donnelly, John, M.E.....	1898..	Mgr. Donnelly Wrecking Co., Kingston, Ont.
Donoghue, W. B., B.Sc.	1912..	Oxford Mills, Ont.
Doyle, C. J., B.Sc.....	1913..	65 York St., Kingston, Ont.
Drewry, G. F., B.Sc.....	1910..	Hydro Elect. Power Comm., Tor- onto, Ont.
Drewry, S., B.Sc.	1917..	Smithfield, Ont.

Name	Date of Graduation.	Address.
Drury, C. W., B.Sc. 1909, A.M.	1910..42	L. Albert St., Kingston, Ont.
Dunkley, J. B., B.Sc.	1911 .23	Renhold Ave., Toronto, Ont.
Dunlap, H. J., B.Sc.	1913..	Interior Dept., Ottawa.
Dunsmore, R. L., B.Sc.	1915..99	Elgin St., St. Thomas, Ont.
Dwyer, E., B.Sc.	1902..45	Charles St., Hamilton, Ont.
†Dwyer, W. O., M.A. '07, B.Sc.	1909..79	Johnston St., Kingston.
Earle, W. S., C.E.	1910..	(Killed in action).
Earnslaw, P., B.Sc.	1915..	Almonte, Ont.
Eaton, H. T., B.Sc.	1913..	Carlisle, Ont.
Elliott, E. F., B.Sc.	1913..	Box 63, Kingston, Ont.
Elliott, R. A., B.Sc.	1912 .	Deloro, Ont.
†Ellis, D. S., M.A. '08, B.Sc.	1910..	School of Mining, Kingston.
Erskine, J. A., B.Sc.	1913..59	Tom St., Hamilton, Ont.
Ewart, McLaren, B.Sc.	1910..	care Resident Engineer, C. P. R., Moose Jaw, Sask.
Fairbairn, H. P., B.Sc.	1912..	Newburg, Ont.
Fairlie, M. F., B.Sc.	1902..	Cobalt, Ont.
Fairlie, T. U., B.Sc.	1905..23	Douglas Drive, Toronto, Ont.
Fairlie, W. A. B.Sc.	1913 .	Box 933, Cobalt, Ont.
Farnsworth, R. H., B.Sc.	1916 .	Coaticook, Que.
Farrell, J. W. D., B.Sc.	1915..	Moosomin, Sask.
Ferguson, M. U., B.Sc.	1904 .	City Engineer, St. Thomas, Ont.
Findlay, A. B., B.Sc.	1908..211	Lenore St., Winnipeg, Man.
Finlayson, M. D., B.Sc.	1903..	Sydney, C.B.
Finnemore, H. F., B.Sc.	1917..	Paris, Ont.
Finnie, H. V., B.Sc.	1906..	Lachine Locks, Que.
Fitzgerald, C. C., B.Sc.	1912..	Interior Dept., Ottawa, Ont.
Fleming, A.A., B.A.	1908 .	Box 2976, Winnipeg, Ont.
Fleming, D. B., B.Sc.	1908..	Hydro-Elect. Power Com., Toronto
Fleming, H. K., B.Sc.	1909..	Craigleith, Ont.
Fleming, T. H., B.Sc.	1918 .	Fredericton, Mo., U.S.A.
Fletcher, W. J., B.Sc.	1910..11	Victoria Block, Windsor, Ont.
Fortescue, C. L., B.Sc.	1898 .	Westinghouse Elec. Mfg. Co., 562 Broad St., Pittsburg, Pa.
Fournier, J. A., B.Sc.	1915..	Sudbury, Ont.
Fox, C. B., M.A.	1895 .	Aluminum Ore Co., East St. Louis, Ill.
†Fraser, C. E., B.Sc.	1916 .	Court House Square, Brockville.
Fraser, D. J., B.A., '07; D.L.S.	1911..	Geodetic Survey Bldg., Ottawa, Ont.
Fraser, O. B. J., B.Sc.	1916..	International Nickel of Can., Ltd. Port Colborne, Ont.
Freeman, C. H., B.Sc.	1913..	Ottawa, Ont.
Frost, E. S., B.Sc.	1910..	care Northern Ont. Light & Power Co., Ragged Chutes, via Cobalt

Name	Date of Graduation.	Address.
Gage, R. G., B.Sc.....	1905..	Moncton, N.B.
Gallagher, O. G., B.Sc.....	1910..	Dept. Interior, Ottawa, Ont.
Gardiner, J. D., B.Sc.....	1913..	141 Cartier St., Ottawa.
Gates, A. B., B.Sc.....	1911..	586 Gilmore St., Peterborough, Ont.
George, G. A., B.Sc.....	1912..	Box 922, Montreal, Que.
George, W. B., B.Sc.....	1911..	Ottawa, Ont.
Germain, H. A., B.Sc.....	1907..	60 Hull Ave., Pittsfield, Mass.
Gerow, S., B.Sc.....	1914..	Rossmore, Ont.
Gibson, J. N., B.Sc.....	1913..	H. M. Gunwharf, Halifax, N.S.
Gillette, O., B.Sc.....	1910..	Dome Mines, South Porcupine, Ont.
Gleeson, J. V., B.Sc.....	1904..	Alaskan & Northern Ry., Seward City, Alaska.
Gleeson, L. J. B.Sc.....	1907..	Interior Dept., Calgary, Alta.
Goebel, N. J., B.Sc.	1918..	New Hamburg, Ont.
Goedike, F. B., B.Sc.....	1910..	
Goodwin, E. L., B.Sc.....	1912..	(Deceased).
†Goodwin, W. M., B.A. '09, B.Sc.	1911..	Alice St., Kingston, Ont.
Gordanier, W. M., B.Sc.....	1903..	Electron, Wash.
Gow, D. B., B.Sc.....	1912..	231 Chambers of Commerce, Winnipeg, Man.
Graham, S. N., B.Sc., '00; C.E....	1900..	Queen's University, Kingston, Ont.
Grant, A. M., B.Sc.....	1908..	Geodetic Survey, Ottawa, Ont.
Grant, J. R., B.Sc.....	1904..	care Royal Engineers' Mess, 'The Chantry, Newark, Notts, Eng.
Gray, A. W., B.Sc.....	1912..	Parks Br. Interior, Ottawa, Ont.
†Gray, S., B.Sc.....	1913..	McKinley Mine, Cobalt, Ont.
Greenland, C. W., B.Sc.....	1913..	Queen's University, Kingston, Ont.
Grenon, J. E., C.E.....	1906..	Box 186, Chicoutimi, Que.
Griesbach, W. C., B.Sc.....	1912..	The Foundation Co., Ltd., Bank of Ottawa Bldg., Montreal, Que.
Grover, G. A., B.Sc.....	1902..	85 Bay St., Toronto, Ont.
Guess, George A., M.A.....	1894..	Professor of Metallurgy, Toronto University, Toronto, Ont.
Guess, H. A., M.A.....	1895..	120 Broadway, New York City.
Haddow, A. W., B.Sc.	1909..	City Engineering Dept., Edmonton, Alberta.
Hagey, C. R., B.Sc.	1915..	15 Edgerton St., Brantford, Ont.
Hambly, W. R., B.Sc., '10; M.D..	1911..	Wingham, Ont.
Hanley, A. C., B.Sc.	1918..	81 Wellington St., Kingston, Ont.
Harding, W. D., B.Sc.....	1912..	Dominion Reduction Co. Mine, Matheson, Ont.
Harding, W. M., B.Sc.....	1908..	Cumberland, B.C.
†Harkness, H. W., B.Sc.....	1913..	Weihhsien, Shantung, China.

Name	Date of Graduation.	Address.
Harkness, R. D., B.Sc.....	1913..	Cornwall, Ont.
Harvey, J. P., B.Sc.....	1913..	Vermillion, Alta.
Hart, S. N., B.Sc.	1910..	P. O. Bldg., Regina.
Hays, C. L., B.Sc.....	1909..	Trent Canal, Campbellford, Ont.
Hazlett, J. W., B.A., B.Sc.....	1903..	(Deceased).
Hemmerich, G., B.Sc.....	1916..	Box 1245, Saskatoon, Sask.
Henderson, E. W., B.Sc.....	1905..	Queen's Univ., Kingston, Ont.
Hepinstall, R. R., B.Sc.....	1914..	New Orleans, La., U.S.A.
Herriot, G. H., B.Sc.....	1907..	2 Martello Apts., 625 Broadway, Winnipeg, Man.
Hill, Jas., M.A., '06, B.Sc.....	1908..	Haileybury, Ont.
Hinton, R. E., B.Sc.	1913 ..	Gananoque, Ont.
Holland, A. A., B.Sc.....	1910..	Nicaragua, CA., via New Orleans, La.
Holmes, T. F., B.Sc.	1917..	Kemptville, Ont.
Houston, D. W., B.Sc.....	1907..	Regina Municipal Railway, Regina Sask.
Howell, G. E., B.Sc.....	1912..	137 George St., Hamilton, Ont.
Huber, W., B.Sc.....	1908..	Bracebridge, Ont.
Huff, F. H., B.Sc.....	1912..	Meaford, Ont.
Hughson, T. L., B.Sc.....	1916..	6 Simcoe St., Niagara Falls, Ont.
Hughston, W. G., B.Sc.....	1911..	Dept. Interior, Ottawa, Ont.
Hughson, W. R., B.A., B.Sc.	1917..	269 University Ave., Kingston, Ont.
†Hutchison, R. H., B.Sc.....	1911..	Box 616, Sudbury, Ont.
Ireland, S. K., B.Sc.....	1913..	153 Ellsworth Ave., Toronto, Ont.
Irwin, R. T., B.Sc.	1907..	Box 57, Porcupine, Ont.
Jackson, A., B.Sc.....	1916..	85 Tisdale St., Hamilton, Ont.
†Jackson, G. J., B.Sc.....	1909 ..	care Cleveland & Cameron, Van- couver, B.C.
Jackson, H. G., B.Sc.....	1903 ..	care W.E. Galbraith "Meadowbank" Bowmanville, Ont.
Jamieson, E., B.Sc.	1917..	Kinburn, Ont.
Jeffery, J. J., B.Sc.....	1908..	Elder's Mills, Ont.
Jeffery, R. T., B.Sc.....	1908..	Hydro-Elec. Power Comm., Toro- to, Ont.
†Jemmett, D. M., M.A., '11; B.Sc..	1913..	Queen's University, Kingston, Ont.
†Jenkins, G. A., B.Sc.....	1909..	Portland, Oregon.
Jenkins, W. E., B.Sc.....	1907..	Box 325, Edmonton, Alta.
Johnston, K. P., B.Sc.	1915..	care Murphy & Underwood, Sask- toon, Sask.
Johnston, P. K., B.Sc.....	1910..	22nd St. W. Fairmont Grove, Up- land, California.
Johnston, W. A., M.A. '03, B.Sc....	1905..	Geological Survey, Ottawa.

Name	Date of Graduation.	Address.
Johnston, W. J., B.Sc.	1915..	Alexandria Hotel, Cananeo, Sonora, Mexico.
Johnston, W. M., B.Sc.....	1913..	Creighton Mines, Ont.
†Joslyn, C. E., B.Sc.....	1916..	Transportation Bldg., Ottawa, Ont.
Kane, W. L., B.Sc.....	1913	
Keeley, D. E., B.Sc.....	1910..	Dome Lake Mine, South Porcupine.
Keeley, E. C., B.Sc.	1917..	Sydenham, Ont.
Keith, G. C., B.Sc. '07, M.Sc.....	1911	435 Grace St., Toronto.
Kelso, J. A., B.Sc. '09, M.Sc.....	1911..	Canada Cement Co., Exshaw, Alta.
Kemp, M. A., B.Sc.....	1912..	Westboro, Ont.
†Kendall, H. C., B.Sc.	1917..	Oakville, Ont.
†Kendall, L. E., B.Sc.....	1912..	8 River Lane, Ottawa, Ont.
†Keon, J. J., B.Sc.	1918..	Sheenboro, Que.
Ker, M. F., B.Sc.	1918	Niagara Falls, Ont.
Kilburn, D. G., B.Sc.....	1907..	Dept. of Rys. & Canals, Ottawa, Ont.
Kilburn, G. H., B.Sc.....	1909..	Rossland, B.C.
King, J. A. S., B.Sc.....	1909..	18 Broadway Ave., Ottawa, Ont.
King, J. L., B.Sc.....	1907..	2622 5th Ave., W. Kitsilano, Vancouver, B.C.
†King, W. W., B.Sc.	1917..	Toronto-Hamilton Highway Comm., Toronto, Ont.
†Kinnard, I. F., B.Sc.	1918..	Marshville, Ont.
Kinnear, L. A., B.Sc.....	1912..	Port Colborne, Ont.
Kirkegaard, C. A., B.Sc.....	1913..	Worthington, Ont.
†Kirkpatrick, A. K. M., B.Sc.	1911..	68 Johnson St., Kingston.
Kirkpatrick, Guy H., B.Sc. '97, M.E.	1898..	Vancouver Club, Vancouver, B.C.
Knight, C. W., B.Sc.....	1903..	Bureau of Mines, Toronto, or 68 St. Leonard's Ave.
La Forest, John M., B.Sc.	1913..	Imperial Munitions, Ottawa, Ont.
Laidlaw, C. O., B.Sc.....	1913..	Springfield, Ont.
Laidlaw, C. T., B.Sc.....	1913..	Springfield, Ont.
Laing, W. S., B.Sc.....	1913..	(Killed in action).
Lamson, B. F., B.Sc.....	1912..	Saranac Lake, N.Y.
La Rush, R. J., B.Sc.....	1913	Cor. Ridgeway & Morse, Rochester, N.Y.
Lavoie, E., B.Sc.....	1907..	Chicoutimi, Que.
Lawler, A. P., B.Sc.....	1911..	218 Alfred St., Kingston, Ont.
†Lawson, W. E., B.Sc.....	1909..	(Died of wounds).
Lawson, W. G., B.Sc.....	1914..	Dundas, Ont.
Lazier, F. S., B.Sc.....	1907..	Trent Canal, Campbellford, Ont.
Lennox, J. S., B.Sc.....	1906	
†Lennox, T. C., B.Sc.....	1911	
Leslie, Eric, B.Sc.	1916	4 Larch St., Halifax, N.S.

Name	Date of Graduation.	Address.
Lewis, A. L., B.Sc.....	1912..	Braden Copper Co., Sewell Ranca- gua, Chile, S.A.
Light, A. K., B.Sc.	1918..	143 Beverley St., Kingston, Ont.
Lodge, W. L., B.Sc.....	1903..	State Agric. College, East Lansing Mich.
Longmore, E. L., B.Sc.....	1912..	Timmins, Ont.
Longwell, A., B.A. '00, B.Sc.....	1903..	410 Crown Office Bldg., Toronto.
Losee, W. H., B.Sc.....	1912..	Highways Dept., Parl. Bldgs., Tor- onto, Ont.
Lumb, W. E., B.Sc.....	1913..	Bancroft, Ont.
Lynch, L., B.Sc.	1915..	Copper Cliff, Ont.
Mabee, Harold C., B.A., B.Sc....	1916..	Dept. of Mines, Ottawa, Ont.
Mabee, Horace C., B.Sc.....	1898..	Dept. of Mines, Ottawa, Ont.
Mackie, F. H., B.Sc.....	1903..	Deceased.
McArthur, F. B.Sc.....	1907..	City Engineer, Regina, Sask.
McAuliff, F. P., B.Sc.....	1913..	Welland, Ont.
Macdonald, J. O., B.Sc.....	1914..	Strathroy, Ont.
MacIlquham, W. L., B.Sc.	41	Grove Ave., Ottawa, Ont.
MacIlquham, W. R., B.Sc.....	1914..	Carleton Place, Ont.
Madden, M. S., B.Sc.....	1910..	Napahee, Ont.
Malcolm, L., M.A. 1905, B.Sc....	1907..	Professor, School of Mining, King- ton, Ont.
Malcolm, Wyatt, M.A.....	1906..	Geological Survey, Ottawa.
Malloch, E. S., B.Sc.....	1910..	Mines Branch, Ottawa, Ont.
Malloch, G. S., B.A. '02, B.Sc....	1906..	(Deceased).
Malloch, N., B.Sc.	1912..	Arnprior, Ont.
Malone, E. E., B.Sc.....	1904..	Imperial Munitions, Ottawa, Ont.
Manhard, W. E., B.Sc.....	1913..	Great Lakes Dredging Co., Ltd., Port Arthur, Ont.
Marshall, J. H. G., B.Sc.....	1908..	Patents Branch, Dept. Trade & Com- merce, Ottawa, Ont.
Marshall, J. R., B.Sc.	1915..	4 Regent St., Ottawa, Ont.
Martineau, J. O., B.Sc.	1915..	170 Desfosses St. St. Roch, Que.
†Mateer, T. J., B.Sc.....	1910..	Deloro, Ont.
Matheson, H., B.Sc.....	1907..	Box 1524, Sudbury, Ont.
†Matheson, H. B.Sc.....	1913..	Pollock Mfg. Co., Kitchener, Ont.
Matthews, H. E., B.Sc.....	1914..	Trenton, Ont.
McCann, W. S., B.Sc.....	1912..	Wellington St., Kingston, Ont.
McCannel, D. A. R., B.Sc.....	1914..	2310 Osler St., Regina, Sask.
McCarthy, F. W., B.Sc.....	1916..	428 Princess St., Kingston, Ont.
McCartney, N., B.Sc.	1915..	231 University Ave., Kingston, On
McColl, C. N., B.Sc.	1908..	Windsor, Ont.
McCullough, F. H., B.Sc.....	1912..	5 High Park Gardens, Toronto, On
McCulloch, R. O., B.Sc.....	1907..	Latchford, Ont.

Name	Date of Graduation.	Address.
McDiarmid, S. R., B.Sc.....	1903..	Vancouver, B.C.
†McDougall, B. W., B.Sc.....	1913..	3924 Halldale Ave., Los Angeles, Calif.
MacDougall, F. H., B.A. '02; M.A. Ph.D.	1903..	University of Minnesota, Minneapolis, Minn.
McDowall, R. J., B.Sc.....	1912..	81 Lower Union St., Kingston, Ont.
McEachern, J. J., B.Sc.	1910..	(Deceased).
†Meek, R. L., B.Sc.....	1913..	325 University Ave., Kingston, Ont.
Meikle, A. U., B.Sc.....	1912..	111 S. Parks St., Ottawa, Ont.
Meikle, M., B.Sc.....	1912..	111 S. Parks St., Ottawa, Ont.
†Melrose, T. M., B.Sc.....	1913..	Coaticooke, Que.
Merritt, C. P., B.Sc.....	1899..	(Deceased).
McEwen, D. F., B.Sc.....	1907..	Hensall, Ont.
McEwen, L., B.Sc.	1912	
McGillivray, C. A., B.Sc.....	1916	New Westminster, B.C.
McGinnis, T. A., B.Sc.....	1909..	Alwington Ave., Kingston.
McGinnis, W. C., B.Sc.....	1908..	(Deceased).
MacGregor, S. E., B.Sc.....	1912..	Hibbing, Minn., U.S.A.
Milden, A. J., B.Sc.....	1908..	Cornwall, Ont.
Millen, W. A., B.Sc.....	1914..	Sandwich, Ont.
Miller, T. R., B.Sc.....	1906	
†Miller, W. C., B.Sc.	1917..	St. Thomas, Ont.
Miller, W. H., B.Sc.	1914..	Renfrew, Ont.
Milliken, J. B., B.A., B.Sc.....	1908..	Topographical Survey, Ottawa.
†Mills, T. S., B.A. '10, B.Sc.....	1911..	Ottawa, Ont.
MacIlquham, W. L., B.Sc.....	1905..	Topographical Survey, Ottawa.
McIntosh, J. S., B.Sc.....	1909	
MacKay, A. A., B.Sc.....	1910..	Helen Mine, Ont.
McKay, B. R., B.Sc.....	1908..	Geological Survey, Ottawa.
McKay, G. J., B.Sc.....	1907..	Ottawa, Ont.
McKay, R. B., B.Sc.....	1904	
MacKenzie, A. A., B.A., 1877; B.Sc., 1877; M.Sc., 1888; D.Sc., 1896..		Thibodaux, La., U.S.
MacKenzie, C. S., B.Sc.....	1913..	Preston, Ont.
Mackenzie, G. C., B.Sc.....	1903..	Dept. of Mines, Ottawa.
MacKenzie, H. A., B.Sc.....	1907..	H. L. Doherty Co., Joplin, Mo.
McKenzie, J. E., B.Sc.....	1912..	231 8th Ave. W., Calgary, Alta.
McKenzie, R. M., B.Sc.....	1912..	Eganville, Ont.
†McKeil, H. W., B.A. '08; B.Sc..	1912..	Sackville, N.B.
McLaren, A. A., B.Sc.....	1911..	Mitchell, Ont.
McLaren, G. R., B.Sc.....	1907..	Magpie Camp, Helen Mines, Ont.
McLennan, K. R., B.Sc.....	1904..	Grand Trunk Ry. Bldg., Montreal, Que.

Name	Date of Graduation.	Address.
McLennan, J. D., B.A., B.Sc.....	1902 .	(Deceased).
McLennan, M. T., B.Sc.....	1916 .	Russell, Man.
†MacLeod, G. W., B.Sc.....	1913..	Sherbrooke. Que.
McNab, A. J., B.A., B.Sc.....	1902..	Mason Valley Mines Co., Thompson, Nevada.
McNally, H. A., B.Sc.	1915..	Westport, Ont.
MacNeill, W. K., B.A. '03, B.Sc...	1905..	1 Glenholme Ave., Toronto, Ont.
McNeice, L. G., B.Sc.....	1913..	Wallaceburg, Ont.
McQuire, R. C., B.Sc.	1918..	123 Beverley St., Kingston, Ont.
McVittie, A. E., B.Sc.....	1914..	Sudbury, Ont.
McVittie, J. S., B.Sc.....	1914..	Sudbury, Ont.
Mohan, R. T., M.Sc.	1911..	Brockville, Ont.
Montgomery, O. M., B.Sc.....	1905..	Kensington, Pa.
Moran, P. J., B.Sc.....	1911..	950 Jarvis St., Vancouver, B.C.
†Morgan, A. L., B.Sc.....	1912..	Sorel, Que.
Morgan, S. C., B.Sc.....	1916 .	Elgin, Ont.
Morgan, W. B.Sc.	1915..	Backus & Johnston, Morococha, Peru, S. Am.
Morrison, A. G., B.Sc.....	1910..	Woodstock, Ont.
Morrison, W. M., B.Sc.....	1910..	Maxville, Ont.
Moyer, J. C., B.Sc.....	1912..	10½ Haynes Ave., St. Catharines, Ont.
Macphail, J. G., B.A. '03, B.Sc....	1905..	Marine Dept., Ottawa.
McPherson, J. C. R., B.Sc.....	1912..	671 College Ave., Woodstock, Ont.
Macpherson, K. P., B.Sc.....	1914..	Prescott, Ont.
McRae, A. D., B.A. '00, B.Sc.....	1902 .	33 First Ave., Ottawa.
McRae, A. E. B.Sc.,	1915..	Patent Office, Ottawa, Ont.
Mac Rostie, N. B., B.Sc.....	1911..	28 Bellwood Ave., Ottawa, Ont.
Mullin, T. B., B.Sc.....	1912 .	Acton, Ont.
Murphy, A. A., B.Sc.....	1907..	Saskatoon, Sask.
Murray, C. W., B.Sc.....	1907..	Mission City, B.C.
Murray, J. C., B.A., B.Sc.....	1901..	Canadian Mining Journal, Toronto.
MacClement, W. T., M.A., D.Sc..	1903..	Prof. of Botany, Queen's University
Neilson, A. C., B.Sc.....	1909..	Stella, Ont.
Neilson, L. R., B.Sc.....	1910..	Stella, Ont.
Neish, A. C., B.A. '98, A.M. '00 Ph.D.	1904..	Instructor in Chemistry, Columbia University, New York.
Newlands, N. A., B.Sc.....	1910..	Care G. W. Jackson Engineering Co. Yonkers, N.Y.
†Newman, W. A., B. Sc.....	1911..	142 Belgrave Ave., Montreal, Que.
Nicholson, M. D., B.Sc.....	1916 .	Goderich, Ont.
Nicol, D. S., B.Sc.....	1909	
Nichols, D. A., B.Sc.....	1911 ..	51 Spruce St., Ottawa, Ont.

Name	Date of Graduation.	Address.
Nicol, Wm., M.A.....	1889..	Professor of Mineralogy, Kingston.
Nixon, N. J., B.Sc.	1915..	Fraser Ridge P.O., Ont.
Noble, D. S., B.Sc.....	1902 .	(Deceased).
Noonan, W. F., B.Sc.	1915..	90 Earl St., Kingston, Ont.
Norrish, B. E., B.Sc.....	1908..	Topographical Survey, Ottawa.
†Norrish, W. H., B.Sc.....	1912..	Dept. Interior, Ottawa, Ont.
Nourse, H. C., B.Sc.....	1914..	5 Elizabeth St., Sherbrooke, Que.
Ockley, R. F., B.Sc.....	1910..	General Elec Co., Schenectady, N.Y.
Orford, C., B.Sc., '08; M.E.....	1909..	DeLamar, Idaho.
Orr, W. J., B.A., B.Sc.....	1909..	1207 Traders Bank Bldg., Toronto.
†Orr, W. S., B.Sc.....	1916..	Cobourg, Ont.
Orser, E. H., B.Sc.....	1910	
Osborne, J. K., B.Sc.....	1909..	C-C-Iron Co., Ishpheming, Mich.
Parrott, J. R., B.Sc.....	1916	Odessa, Ont.
Parsons, C. S., B.Sc.	1913..	Dept. of Mines, Ottawa.
Patterson, R. P., B.Sc.	1915..	Newburgh, Ont.
Patterson, G. B., B.Sc.	1915..	856 Hellmuth Ave., London, Ont.
†Patterson, T. R., B.Sc.	1918..	Auburn, Ont.
Patton, J. H., B.Sc.	1914..	(Killed in action).
Pearse, W. G., B.Sc.....	1914..	London, Ont.
Peeling, C. U., B.Sc.....	1909..	Cornwall, Ont.
Pense, E. H., B.Sc.....	1903..	55 West St., car Mrs. Pense, Kingston, Ont.
Peppard, H. M., B.Sc.....	1907..	Box 461, Springhill, N.S.
Perry, O. M., B.Sc.....	1909..	Box 26, Windsor, Ont.
Pettingill, E. L., B.Sc.....	1916..	Wellington, Ont.
Phillips, H. L., B.Sc.....	1912..	Cornwall, Ont.
Pierce, C. B., B.Sc.....	1912..	(Killed in action).
Pinkerton, W. A., B.Sc.....	1906..	Richdale, Alta.
Platt, B. C., B.Sc.	1915..	94 Concord Ave., Toronto, Ont.
Pope, F. J., M.A. '91, Ph.D.....	1899..	Room 1503, 71 Broadway, New York City.
Potter, R., B.Sc.....	1907	
Pound, J. F., B.Sc.....	1913..	215 Balsam Ave., Hamilton, Ont.
Pringle, F. D., B.Sc.	1917	Hamilton, Ont.
Pringle, J. F., B.A., '05; C.E.....	1907..	313 Tegler Bldg., Edmonton, Alta.
Prittie, L. C., B.Sc.....	1912..	Hydrographic Survey Dept. Naval Service, Ottawa, Ont.
Prouse, S. E., B.Sc.	1915	Aylmer, Ont.
Purvis, S. A., B.Sc.....	1912..	646 Seventh Ave. N. E. Edmonton, Alta.
Putman, C. V., B.Sc.	1915..	61 Putman Ave., Ottawa, Ont.
Recknor, E., B.Sc.	1915	Princeton, Ont.
Raitt, G. H., B.Sc.....	1914..	148 Percy St., Ottawa, Ont.

Name	Date of Graduation.	Address.
Ramsay, J. H., B.Sc.....	1911..75	Hogarth Ave., Toronto, Ont.
Ransom, F., B.Sc.	1909..	Care Tennessee Copper Co., Copperhill, Tenn.
Rawlins, J. W., B.A. '99, B.Sc....	1901..	Copper Cliff, Ont.
Redmond, A. V., B.Sc.....	1903..	Box 12, C.N.R., Winnipeg, Man.
Reid, F. D., B.Sc.....	1904..	Care Coniagas Mines Ltd., Cobalt, Ont.
Reid, J. A., B.Sc.....	1902..	Field Engineer, O'Brien Mine, Cobalt, Ont.
Reid, T. J., B.Sc.....	1911..	Victoria St., Kingston, Ont.
Rice, G. T., B.Sc.....	1912..	403 Atlantic Ave., Winnipeg, Man.
Richardson, G. T., B.Sc.....	1906..	(Killed in action).
Richmond, D. W., B.Sc.....	1908..	190 University Ave., Kingston, Ont.
Ringsleben, W. C., B.Sc.	1917..	Queen's University, Kingston, Ont.
Ritchie, G., B.A., B.Sc.....	1878..43	Victoria St., Toronto, Ont.
†Roach, D. J., B.A., 1915; B.Sc...	1916..	Sault Ste Marie, Ont.
Robbins, C. A., B.Sc.	1915..	160 Nelson St., Brantford, Ont.
†Robertson, J. A. T., B.Sc.....	1912..	Technical College, Chentu, W., China.
Robertson, J. J., B.Sc.....	1906..	Lima, Peru, S.A.
Robinson, E. K., B.Sc.	1915..	167 Alfred St., Kingston, Ont.
Robinson, S. D., B.Sc.....	1911..	93 Division St., Kingston, Ont.
Rockwell, D. B., B.Sc.....	1908..	Care Mr. Newcome, Seattle, Wash.
Rogers, A. B., B.Sc.	1917..	Box 128, Gananoque, Ont.
Rogers, G. R., B.Sc.....	1916..	(Killed in action).
Rogers, H. D., B.Sc.	1913..	Box 128, Gananoque, Ont.
†Rogers, R. A., B.Sc.....	1912..	Gananoque, Ont.
Rogers, W. R., B.Sc.....	1907..	Bureau of Mines, Toronto.
Rooney, J. T., B.Sc.....	1911..	521 St. John St., Quebec, Que.
Rose, B., B.Sc., '09; Ph.D.....	1913..	Geol. Survey, Ottawa, Ont.
†Rose, J. H., B.Sc.....	1910..	Thompson, Nevada.
Rose, S. L. E., B.Sc.....	1903..	Schnectady, N.Y.
Ross, J. C., B.Sc.	1915..	308 Gillette Bldg., Tulsa, Okla.
Rutledge, P., B.Sc.....	1914..	23 Roslyn Ave., Ottawa, Ont.
Ryan, F. H., B.Sc.....	1909..	199 Brock St., Kingston, Ont.
Saint, J. B., B.Sc.....	1909..	867 Broadway East, Vancouver, B.C.
Sanders, J. M., B.Sc.....	1907..	McMan Oil Co., Tulsa, Okla.
Saunders, H. C., B.Sc.....	1909..	335 4th St. Edmonton, Alta.
Sawyer, E. P., B.Sc.....	1912..	Westmount, Que.
Schofield, S. J., B.A. '06, M.A. '07 B.Sc. '08; Ph.D.....	1912..	Geological Survey, 221 Wellington St., Ottawa, Ont.
Scott, A., B.A.....	1899..	Gadsby, Alta.
Scott, H. H., B.Sc.....	1905..	(Deceased).

- Scott, H. L., B.Sc.....1914..Langham, Sask.
- Scott, J. M., B.Sc.....1912..Provincial Normal College, Truro,
N.S.
- Scott, J. N., B.Sc.....1909..Wallaceburg, Ont.
- Scott, O. N., B.Sc.....1903..Ontario Club, Toronto, Ont.
- Scott, T. S., B.A. '94; B.Sc.....1897..Royal Can. Engineers, Halifax, N.S.
- †Scovil, S. S., B.Sc.....1912..Kenora, Ont.
- Sears, J., B.Sc.....1905..T. & N. O. Ry., Englehart, Ont.
- Sherrill, J. R., B.Sc.....1914..Athol Springs, N.Y.
- Shields, M. S., B.Sc.1915..3524 Marvin Ave., Cleveland, Ohio.
- †Shirley, E. R., B.A., B.Sc.....1912..Laurentian Power Co., Rivere Des
Roches, Que.
- Shorey, E. C., B.A. '86, M.A. '87,
D.Sc.1896..Bureau of Soils, U.S. Dept. of Agric.
Washington, D.C.
- Shorey, P. M., B.Sc.....1906..care Y.M.C.A., Brantford, Ont.
- Silver, L. P., B.Sc. '02; A.M.....1905..420 St. Paul St., Montreal, Que.
- Simmons, G. A., B.Sc. '10; M.D..1912..Mountain, Ont.
- Sine, F., M.A. '06; B.Sc.....1908..Sydenham, Ont.
- Sirrett, E. J., B.Sc.....1913..608 Church St., Toronto, Ont.
- Sirvage, E. G., B.Sc.....1912..Box 497, Chesterville, Ont.
- Skinner, H. L., B.Sc.....1914..116 Gore St., Kingston, Ont.
- Slinn, W. H., B.Sc.....1916..572 Princess St., Kingston, Ont.
- Slipper, S. E., B.Sc.1911..Port Arthur, Ont.
- Skinner, P. E., B.Sc.1915..Keene, Ont.
- Sloan, D., B.Sc.....1905..206 Bank of Ottawa Bldg., Vancou-
ver, B.C.
- Smail, H. A., B.Sc.....1914..Militia Dept., Ottawa, Ont.
- Smeeton, W. F., B.Sc.....1901..Buffalo-Ontario Smelting Co., King-
ston, Ont.
- Smith, G. J., B.Sc.1915..Albert St., Kingston, Ont.
- Smith, J. G. B.Sc.....1916..Kingston, Ont.
- Smith, L. J., B.Sc.1918..Westboro. Ont.
- Smith, R. F., B.Sc.....1916..Trenton, Ont.
- Smith, R. T., B.Sc.1915..Box 169, Sudbury, Ont.
- Smith, R. M., B.Sc.....1914..Parl. Bldgs., Highway Dept., Tor-
onto, Ont.
- Smith, W. N., B.Sc.....1914..Box 169, Sudbury, Ont.
- †Smythe, E. S., B.Sc.....1912..77 Duke St., Kitchener, Ont.
- Smyth, W. L., B.Sc.....1906..Pembroke, Ont.
- Snider, D. R., B.Sc.1917..Waterloo, Ont.
- Sommerville, J. E., B.Sc.....1912..Seaforth, Ont.
- Spearman, C., B.Sc.....1910..Columbia University, New York,
N.Y.

- Speirs, T. B., B.Sc.....1909..123 Sherwood Ave., Toronto, Ont.
 Spence, W. A., B.Sc.1917..159 Centre St., Ottawa, Ont.
 Squire, A. M., B.Sc.....1909..2 Kensington Ave., Kingston, Ont.
 Squire, R. L., B.Sc.....1904..
 †Stanley, J. L., B.Sc.....1910..Port Colborne, Ont.
 Stanley, J. N., M.A., '01, B.Sc....1908..Ont. Hydro-Elect. Co., Nipigon, Ont.
 Stanley, O., B.Sc.....1910..Copper Cliff, Ont.
 Stephens, W. E., B.Sc.....1916..190 Wellington St., London, Ont.
 Sterne, E. T., B.Sc.....1913..Can. Explosives, Beloeil, Que.
 †Steven, H. A., B.Sc.1917..Worthington, Ont.
 Stevens, F. G., B.Sc. '00, M.E....1901..1229 Traders Bank Bldg., Toronto
 Stewart, J. S., B.Sc.....1911..Box 221, Renfrew. Ont.
 Stewart, N. G., B.Sc.1915..Renfrew, Ont.
 Stewart, W. G., B.Sc.....1914..Waba, Ont.
 Stidwill, F., B.Sc.....1908..Cornwall, Ont.
 Stiles, L. P., B.Sc.....1907..Northern Elec. Co., Toronto, Ont.
 Stilwell, A. J., B.Sc.....1902..534 East Main St., Corry, Pa.
 Stinson, J. N., B.Sc.....1914..Dept. Interior, Ottawa, Ont.
 Stirling, J. B., B.A. '09, B.Sc....1911..Alice St., Kingston, Ont.
 Stott, J., B.Sc.....1908..716 Pender St. W., Vancouver, B.C.
 Strachan, B. O., B.Sc., M.E.....1905..Box 507, Ely, Minn.
 Sutherland, T. F., B.Sc.....1904..133 St. Leonard's Ave., Toronto.
 Sutherland, E., B.Sc. '02, M.D....1906..Cardinal, Ont.
 Sweezy, R. O., B.Sc.....1908..Union St., Kingston, Ont.
 Taylor, L. G., B.Sc.....1914..32 Conroy St., Quebec, Que.
 Tett, B., B.Sc.....1904..Bratton, Sask.
 Thomas, A. S., B.Sc.....1911..Forestry Branch, Ottawa, Ont.
 Thompson, A. T., B.Sc.....1904..Dominion Lighthouse Dept., Prescott, Ont.
 Thornton, L. A., B.A., B.Sc.....1906..City Commissioner, Regina, Sask.
 Timm, W. B., B.Sc.....1906..Dept. of Mines, Ottawa.
 †Tobias, G. A., B.Sc.1918..London, Ont.
 Tower, W. O., B.Sc.....1912..282 William St., Belleville, Ont.
 Tremblay, J. A., B.Sc.....1911..City Hall, Quebec, Que.
 Trueman, J. D., B.A., B.Sc.1908..(Deceased).
 Tuckett, W. H., B.Sc.....1911
 Turner, N. L., M.A.....1907..P.O. Box 462, Ottawa, Ont.
 Turner, S. R., B.Sc.....1916..Box 47, Hawkesbury, Ont.
 Twitchell, K. S., B.Sc.....1908..Romley, Colo.
 †Uglove, W. L., M.A. '06; B.Sc. '11
 M.Sc.1912..164 Barrie St., Kingston.
 †VanPatter, H. S., B.Sc.1915..Aylmer, W., Ont.
 Vincent, G. G., B.Sc.1918..Woodstock Ont.
 Vogan, G. O., B.Sc.1917..36 Dundonald St., Toronto, Ont.

- Waldner, E. F., B.Sc.....1912..Peoples Bank Rooms, Sacramento,
California.
- Walker, H. J., B.A. '02, B.Sc....1904..Cornwall, Ont.
- Walker, T. L., M.A. '90, Ph.D.....Professor of Mineralogy, Toronto
University, Toronto.
- Walton, C. G., B.Sc.1915..176 King St. E., Brockville, Ont.
- †Wardle, J. M., B.Sc.....1912..Supt. Rocky Mts. Park, Banff, Alta.
- Warren, H., C.E., '12; B.Sc.....1913..Murray Bay, Que.
- Watson, R. R., B.Sc.....1912
- †Watts, E. E., B.Sc. '12, M.Sc....1914..Moose Creek, Ont.
- Way, W. C., B.Sc., 1905, M.Sc.....1906..Dept. Interior, Ottawa, Ont.
- Webster, A. R., B.Sc.....1904..Cobalt, Ont.
- Wells, J. Walter, B.Sc.....1898..Toronto, Ont.
- Whillans, T. O., B.Sc.1917..Hurdman's Bridge, Ont.
- White, H. T., B.Sc.....1909..Nobel, Ont.
- Whyte, J. S., B.Sc.....1914..St. Thomas, Ont.
- Wigle, E. R., B.Sc.....1913..Box 445, Sault Ste. Marie.
- Wilgar, W. P., B.Sc.....1903..Queen's University, Kingston, Ont.
- Wilkins, C. V., B.Sc.....1916..Trenton, Ont.
- Wilkinson, J. B., B.Sc.1915..Fredericton, N.B.
- Williams, H. J., B.Sc.1917..150 University Ave., Kingston, Ont.
- Williams, K. F., B.A. '09, B.Sc...1910..(Deceased).
- Williams, M. Y., B.Sc. '09, Ph.D..1912..10 Willard Ave., Ottawa, Ont.
- Williams, T. B., B.Sc. '09; M.Sc..1912..Picahontas, Alta.
- †Willrich, E. G., B.Sc.....1914..San Antonia, Texas.
- Wilson, E. E., B.Sc.1913
- Wilson, E. E. D., B.Sc.....1911..Dept. Interior, Ottawa, Ont.
- Wilson, D. M., B.Sc.1914..Walkerton, Ont.
- Wilson, R. R., B.Sc.....1913..148 Farnham Ave., Toronto, Ont.
- †Wood, F. M., B.Sc.....1914..385 Johnson St., Kingston, Ont.
- Woods, S. A., B.Sc.....1909..Canadian Westinghouse, Hamilton,
Ont.
- Woolsey, W. J., B.Sc.....1907
- Workman, C. W., B.Sc.....1903..St. Catharines, Ont.
- Workman, J. K., B.Sc.....1904..Copper Cliff, Ont.
- Wright, A., B.Sc.1905..Welland, Ont.
- Wright, G. C., B.Sc.....1907..Member of firm, Campbell &
Wright, Kingston, Ont.
- Wright, J. G., B.Sc.1917..Box 546 Valleyfield, Que.
- Wright, L. E., B.Sc.....1911..Exper. Farm, Ottawa, Ont.
- †Wrong, G. S., B.Sc.1918..9 Vera Place, Windsor, Ont.
- Yates, B. T., B.Sc.1917..Cornwall, Ont.
- Young, A. C., B.Sc.....1910..Renfrew, Ont.
- Young, J. H., B.Sc.....1910..Dept. of Agric., Ottawa, Ont.

LIST OF SCIENCE STUDENTS.

FIRST YEAR.

Name.	Address.
/Baxter, W. W.	116 East Ave. S., Hamilton, Ont.
/Beer, G. A.	592 Jarvis St., Toronto, Ont.
/Black, J. H.	Fergus, Ont.
/Bleakney, H. H.	108 Broadway Ave., Ottawa, Ont.
/Bowley, J. W.	52 Beverley St., Kingston, Ont.
/Bradt, W.	49 Head St., Hamilton, Ont.
Bulmer, C. E.	299 University Ave., Kingston, Ont.
/Campbell, C. A.	R.R. No. 4, Iona Sta., Ont.
Cooper, N. C.	Orillia, Ont.
/Cowan, D. C.	Gananoque, Ont.
Detlor, W. K.	Box 482, Deseronto, Ont.
Devenny, J. P.	Renfrew, Ont.
/Donnelly, T. J.	30 Main St., Kingston, Ont.
417 Doyle, J. E.	Frankford, Ont.
/Duncan, S. M.	Ottawa, Ont.
/Easson, W. L.	52 Colborne St., Kingston, Ont.
Ellis, C.	Branchton, Ont.
/Ellis, F. J.	Lake Saskatoon, Sask.
21 Fair, H. M.	380 Brock St., Kingston, Ont.
/Ferguson, J. G.	Vankleek Hill, Ont.
/Fraser, W. S.	107 Ontario Ave., Hamilton, Ont.
Frid, C. H.	383 Dundurn St. S., Hamilton, Ont.
/Gauley, J. B.	Vars, Ont.
Geiger, D. G.	276 Albert St., Kingston, Ont.
Hamilton, A. G.	21 Sydenham St., Kingston, Ont.
Hanna, J. A.	Parrsboro, Cumberland Co., R.R. No. 1 N.S.
32/Hansuld, S. B.	208 Cobourg St., Stratford, Ont.
432/Harford, C. G.	405 Quebec Ave., Toronto, Ont.
/Harkness, A. E.	Iroquois, Ont.
Hewgill, P. F.	56 Earl St., Kingston.
21 Koen, J. D.	Sydenham, Ont., R.R. No. 1.
Lafontaine, W. O.	Cornwall, Ont.
Lang, A. T.	342 Boyd Ave., Winnipeg, Man.
/Lawrence, W. M.	Guelph, Ont., R.R. No. 3.
/Lockett, L. W.	Kingston, Ont.
/McBean, K. D.	Millbrook, Ont.
McDonough, E.	Haileybury, Ont.
/McIntyre, G. N.	408 Palmerston Blvd., Toronto, Ont.
/McKechnie, A. B.	15 Albany Ave., Toronto, Ont.
/Maguire, J. A.	Campbellford, Ont.

Name.	Address.	Course.
Melvin, H. F.	Vars, Ont.	
Meredith, C. H.	Elma, Ont.	
Morren, F. V.	Barrie, Ont.	
Mott, R. C.	181 Bridge St. E., Belleville, Ont.	
Munro, C. W.	Martintown, Ont.	
Myers, H. R.	99 Ontario St., Stratford, Ont.	
O'Reilly, C. A.	Brockville, Ont.	
Parker, R. L.	Tynemouth, N.B.	
Roney, G.	Kingston, Ont.	
Roughton, D. R.	167 King St., Kingston, Ont.	
Roy, E. W.	Napanee, Ont.	
Saunders, J. B.	124 Beverley St., Kingston, Ont.	
Searle, H. E.	156 Frontenac St., Kingston, Ont.	
Smith, C.	Odessa, Ont.	
Swan, L.	Deseronto, Ont.	
Taylor, N. J.	Port Colborne, Ont.	
Urquhart, M. L.	Martintown, Ont.	
VanBuskirk, J. E.	276 Charles St., Belleville, Ont.	
Wallace, A. M.	380 Barrie St., Kingston, Ont.	
Walsh, B. J.	Perth, Ont.	
Williams, K. J.	270 Johnson St., Kingston, Ont.	
Wilson, D.	Carp, Ont.	
Wilson, R. H.	Sault Ste. Marie, Ont.	

SECOND YEAR.

Armitage, H. F.	Deseronto	Civil.
Bailey F. M.	Winchester	Chem. & Met. Eng.
Cobb, C. E.	Tweed	Civil.
Disher, R. M.	Ridgeway	Electrical.
Finkle, C. S.	Trenton	Electrical.
Moore, R. G.	Pembroke	Chemical.
Norton, H. A.	Kingston	Chem. & Met. Eng.
Notman, D. O.	St. Catharines	Chemical.
Parnell, W. C.	Trenton	Electrical.
Rosenfield, D. N.	Cornwall	Civil.
Sills, H. R.	Kingston	Electrical.
Simpson, C.	Cornwall	

THIRD YEAR.

Baltzer, C. E.	Preston	Mechanical.
de la Franier, L. H.	Stratford	Mining.
Garrett, A. R.	Kingston	Civil.
MacIntosh, J. F. A.	Alexandria	B.A., B.Sc.

Name.	Address.	Course.
McLeod, G. D.....	Kingston	Mining.
Poynton, C. A.....	Toronto	Mineralogy & Geology.
Rowley, H. J.....	St. John, N.B.	Chemical.
Stauffer, J. S.....	Galt	Chem. & Met. Eng.
Young, R. J.....	Kingston	Chemical.

FOURTH YEAR.

Buss, J.....	Mille Roches	Chem. & Met. Eng.
Fleming, M. C.....	R.R. 3, Owen Sound..	Chem. & Met. Eng.
Goodearle, H. L.....	Kingston	Chem. & Met. Eng.
Imbleau, T.....	Renfrew	Mechanical.
Knowles, C. W.....	Newport Landing, N.S..	Civil.
Luney, O. G.....	London, Ont.	Electrical.
Marrison, W. A.....	Cataraqui	Physics.
Mills, A. M.....	Ottawa	Civil.
Moore, C. M.....	Sydenham	Civil.
Sims, T. A.....	Little Current	Electrical.
Ringsleben, W. C.....	Renfrew	Post Graduate.

TIME TABLE—FIRST YEAR.

	VIII.	IX.	X.	XI.	XII.	I.	II.	III.	IV.
Mon.	English	Math. II		Math. III		Physics I. Sects. c.d.	Physics I. Sects. c.d.	Draw. I. Sects. d.e.f.	Draw. I. Sects. d.e.f.
Tues.	English	Math. I.	Physics I.	Chem. I		Chem. I Sects. a.b.c. Desc. Geo. Sects. d.e.f.	Chem. I Sects. a.b.c. Desc. Geo. Sects. d.e.f.	Chem. I Sects. a.b.c. Desc. Geo. Sects. d.e.f.	Physical Drill
Wed.		Math. II	Physics I.	Math. III		Physics I. Sects. a.b. Draw. I Sects. d.e.f.	Physics I Sects. a.b. Draw. I Sects. d.e.f.	Draw. I Sects. d.e.f.	
Thurs.	English	Math. I.	Physics I.	Chem. I		Physics I Sects. c.f. Draw. I Sects. a.b.c.	Physics I Sects. c.f. Draw. I Sects. a.b.c.	Draw. I. Sects. a.b.c.	Physical Drill
Fri.	English	Math. II		Astron. I		Chem. I Sects. d.e.f. Desc. Geo. Sects. a.b.c.	Chem. I Sects. d.e.f. Desc. Geo. Sects. a.b.c.	Chem. I Sects. d.e.f. Desc. Geo. Sects. a.b.c.	
Sat.		Draw. I Sects. a.b.c.	Draw. I Sects. a.b.c.						

TIME TABLE—SECOND YEAR.

	VIII.	IX.	X.	XI.	I.	II.	III.	IV.
Mon.	Phys. II	Surv. II A.C., E.F.G.	Math. V	Gen. Eng. I B.D., E.F.G.	Draw. II A.C., B.D.	Draw. II A.C., B.D.	Draw. II A.C., B.D. Phys. II E.F.G.	Phys. II E.F.G.
Tues.	Math. IV (a) Astron. II (b) A.C., E.F.G.	Geol. I A.C.	Math. V	Min. I A.C., B.D. Anal. Ch. VII E.F.G.	Anal. Ch. II A.C., B.D. Draw. III E.F.G.	Anal. Ch. II A.C., B.D. Draw. III E.F.G.	Anal. Ch. III A.C., B.D. Draw. III E.F.G.	Anal. Ch. III A.C., B.D.
Wed.	Phys. II	Geol. I A.C. Mech. Eng. IX E.F.G.	Astron. II A.C., E.F.G.	Genl. Ch. II A.C., B.D.	Anal. Ch. I A.C., B.D. Surv. III (a) Draw. III (b) E.F.G.	Anal. Ch. I A.C., B.D. Surv. III (a) Draw. III (b) E.F.G.	Anal. Ch. I A.C., B.D. Surv. III (a) Draw. III (b) E.F.G.	Anal. Ch. III A.C., B.D.

SECOND YEAR—Continued.

	VIII	IX	X	XI	I.	II.	III.	IV.
Thurs.	Math. IV(a) Math. V (b)	Gen. Eng. I B.D. E.F.G.	Astron. II A.C. E.F.G.	Surv. II E.F.G.	Surv. III E.F.G. Surv. I A.C., B.D.	Surv. III E.F.G. Surv. I A.C., B.D.	Surv. III E.F.G. Surv. I A.C., B.D.	
Fri.	Phys. II	Surv. I A.C., B.D.	Min. I A.C., B.D.	Min. I A.C., B.D.	Anal. Ch. IV B.D.	Anal. Ch. IV B.D.	Anal. Ch. IV B.D.	
		Mech. Eng. IX E.F.G.	Mech. Eng. IX E.F.G.		Anal. Ch. VIIa E.F.G. Phys. III (b) E.F.G.	Anal. Ch. VIIa E.F.G. Phys. III (b) E.F.G.	Anal. Ch. VII E.F.G.	
	Min. Geol. Excursions till Nov. 27th.							
Sat.	Anal. Ch. IV B.D.	Phys. II A.C., B.D. Shopwork I. E.F.G.	Phys. II A.C., B.D. Shopwork I. E.F.G.	Shopwork I. E.F.G.				

TIME TABLE—THIRD YEAR.

For Session 1919-20 only.

VIII.	IX.	X.	XI.	I.	II.	III.	IV.
Ore Dressing A.C.D.F.	Elec. Eng. I A.D.E.F. Anal. Ch. V C.	Geol. IV(a) A.C. Org. Ch. II B. Geol. II(b) C. Sur. IV E.	Gen. Eng. I A. Min. III(b) B. Org. Ch. II B. Min. II(a) B.C. Anal. Ch. V C. Surv. IV E. Mech. Eng. IV F. Elec. Eng. II G.	Phys. Ch. I C. Gen. Eng. II D.E.F.G. Geol. III Lab. A.C., Sect. a	Phys. Ch. I B.C.D. Struct. Eng. III E. Phys. IV G. Geol. III Lab. A.C., Sect. a	Phys. Ch. I B.C.D. Struct. Eng. III E. Mech. Eng. III F. Phys. IV G. Geol. III Lab. A.C., Sect. b	German C. Phys. Ch. I B.D. Struct. Eng. III E. Mech. Eng. III F. Geol. III Lab. A.C., Sect. b Anal. Ch. VI B.
Mon.							
Min. IV A.B.C.	Geol. I B. Mining I(b) A. Thermo I(a) A.D.E.F.G. Thermo II(b) D.E.F.G.	Geol. III A.C. Org. Ch. I D. Org. Ch. II B. Hyd. Eng. I E.F.	Met. I. A.B.D.E.F.G. Org. Ch. I D.	Min. IV A.B.C. Gen. Eng. VI(b) E. Surv. V(a) E. Mech. Eng. III D.F. Ind. Ch. II F. Elec. Eng. III G.	Min. IV A.B.C. Gen. Eng. VI(b) E. Surv. V(a) E. Mech. Eng. III D.F. Elec. Eng. III G.	Anat. Ch. VI B. Gen. Eng. VI(b) E. Surv. V(a) E. Mech. Eng. III D.F. Elec. Eng. IV. G. Geol. III Lab. A.C., Sect. c	Mech. Eng. III D.F. Elec. Eng. IV. G. Geol. III Lab. A.C., Sect. c
Tues.	Ind. Ch. I B.D. Struc. Eng. I E.F.						
Wed.	Met. I ABDEFG Min. VI(b) C. Min. II(a) B.C.	Mech. Eng. VII A.E. Elec. Eng. II G.	Mining I A. Min. III(b) B. Min. V(a) E. Mech. Eng. I(a) II(b) D(a) F.G. Struct. Eng. III E.	Min. IV A.B.C. Surv. IV. E.	Anat. Ch. IV A. Ry. Eng. I E. Shopwork I D. Thermo V. F. Phys. IV G.	Anat. Ch. II B. Anal. Ch. VI C. Ry. Eng. I E. Shopwork I D. Thermo V. F. Phys. IV G.	Org. Ch. II B. Anal. Ch. VI C. German C. Shopwork I D. Thermo V. F.

VIII.	IX.	X.	XI.	I.	II.	III.	IV.
Economics I	Gen. Eng. I A. Org. Ch. II B. Anal. Ch. V D.	Geol. III A.C. Anal. Ch. V B.D. Hyd. Eng. I E.F. Phys. IV G.	Ore Dressing A.C.D. I Org. Ch. I B.D. Anal. Ch. V B. Ry. Eng. I E. Mech. Eng. IV Elec. Eng. III(a)G Elec. Eng. II(b)G	Sur. VII A. Anal. Ch. V C. Gen. Eng. III A.D.E.F.G.	Sur. VII A. Anal. Ch. V C. Geol. I. B. Gen. Eng. III A.D.E.F.G.	Anal. Ch. V B.D.	Min. IV B.C.
	Elec. Eng. II G.	Geol. IV (a) A.C. Anal. Ch. VI B. Mech. Eng. I (a) II (b) D (a). F.G. Ry. Eng. I E.	Sur. VII A. Anal. Ch. VI B.C. Mech. Eng. I (a) II (b) D (a) F.G. Sur. IV E.	Anal. Ch. IV A. Ind. Ch. I B.D. Anal. Ch. VI C. Str. Eng. I E.F. Elec. Eng. II G.	Anal. Ch. IV A. Anal. Ch. V B.D. Str. Eng. I E.F. Elec. Eng. II G.	Anal. Ch. IV A. Anal. Ch. V B.D.	Engineering Society
Mining I(a) A Phys. Ch. I B.C.D.	Thermo I (a) A.D.E.F.G. Elec. Eng. I(b) A.D.E.F. Min. III (b) Anal. Ch. VI B.C. Elec. Eng. III(b) G.	Geol. IV (a) A.C. Anal. Ch. VI B. Mech. Eng. I (a) II (b) D (a). F.G. Ry. Eng. I E.	Sur. VII A. Anal. Ch. VI B.C. Mech. Eng. I (a) II (b) D (a) F.G. Sur. IV E.	Anal. Ch. IV A. Ind. Ch. I B.D. Anal. Ch. VI C. Str. Eng. I E.F. Elec. Eng. II G.	Anal. Ch. IV A. Anal. Ch. V B.D. Str. Eng. I E.F. Elec. Eng. II G.	Anal. Ch. IV A. Anal. Ch. V B.D.	
Fire Assay(b) A.C.D. Ind. Ch. I B.D.	Fire Assay (b) A.C.D. Ind. Ch. I B.D. Eng FldWk.II(a) E. Mech. Eng. III F. Elec. Eng. IV G. Survey. V(b) E	Fire Assay (b) A.C.D. Ind. Ch. I B.D. Eng FldWk.II(a) E. Mech. Eng. III F. Elec. Eng. IV G. Survey. V(b) E	Fire Assay (b) A.C.D. Ind. Ch. I B.D. Eng FldWk.II(a) E. Mech. Eng. III F. Elec. Eng. IV G. Survey. V(b) E				

Thurs.

Fri.

Sat.

TIME TABLE—FOURTH YEAR.

For Sessions 1919-20, and 1920-21 only.

VIII.	IX.	X.	XI.	I.	II.	III.	IV.
Org. Ch. III B.	Met. II A.C.D. V Org. Ch. I B.	Mining II A. Ch. V Org. Ch. IV B.	Mech. Eng. IV A.D.E.G. V Org. Ch. V Genl. Ch. IV B.	Gen. Eng. II A. Ch. XI Mech. Eng. XI F.G.(B) Phys. Ch. II B.D.	Phys. Ch. II B.D.	Geol. VIII A.C.	
Ore Dressing D.	Genl. Ch. IV B.	Gen. Eng. V E.	Geol. VI C.			Phys. Ch. II B.D.	
	Ry. Eng. II, III E.	Elec. Eng. VII F.	Elec. Eng. VII F.	Mech. Eng. VIIIa G.	Mech. Eng. V F.(a)	Mech. Eng. V F.(a)	Economics II
	Mech. Eng. V F.	Elec. Eng. V G.		Elec. Eng. VIIIb G.	Mech. Eng. VIIIa G.	Mech. Eng. VIIIa G.	
Org. Chem. V B.	Org. Ch. V B.	Org. Ch. V B.	Org. Ch. III B.	Gen. Ch. IV B.	Min. & Met. IV A.	Org. Ch. V B.	
Gen. Ch. IV B.	Gen. Ch. IV B.	Hyd. Eng. I A.G.	Geol. VIII A.C.		Gen. Ch. III B.D.	Min. & Met. IV A.	Org. Ch. III B.
Struct. Eng. I D.	Mining C. Met. II A.C.D.	Org. Ch. I D.	Org. Ch. I D.	Indus. Ch. II. A.E.	Struct. Eng. IV E.	Struct. Eng. IV E.	Struct. Eng. IV E.
	Ch. Eng. I D.	Ch. Eng. I D.		Struct. Eng. I D.	Struct. Eng. I D.	Struct. Eng. I D.	
Struct. Eng. II E.	Mech. Eng. VI F.	Mech. Eng. VI F.	Munic. Eng. II E.	Mech. Eng. V F.	Mech. Eng. V F.	Mech. Eng. V F.	Mech. Eng. V F.
	Elec. Eng. V G.		Thermo III F.G.		Telec. Eng. V. G.	Elec. Eng. V G.	Elec. Eng. V G.
Min. VI A.B.	Mining II A.	Gen. Eng. II A.	Org. Ch. IV B.	Min. & Met. IV A.D.	Min. & Met. IV A.D.	Min. & Met. IV A.D.	
Org. Ch. V B.	Org. Ch. V B.		Mining I C.	Org. Ch. IV B.	Org. Ch. IV B.	Org. Ch. IV B.	Gen. Ch. III B.D.
Genl. Ch. IV B.	Phys. Ch. II B.D.	Phys. Ch. II B.D.	Ch. Eng. I D.	Anal. Ch. VI D.	Anal. Ch. VI D.	Anal. Ch. VI D.	
Met. I D.	Highway Eng. E.	Highway Eng. E.	Hyd. Eng. II E.	Munic. Eng. III E.	Gen. Eng. IV E.	Gen. Eng. IV E.	
Ind. Ch. I D.	Mech. Eng. V F.	Mech. Eng. V F.	Mech. Eng. V F.	Mech. Eng. V F.	Mech. Eng. V F.	Mech. Eng. V F.	Mech. Eng. V F.
	Elec. Eng. IX F.	Elec. Eng. IX F.	Ry. Eng. II E.				
	Elec. Eng. V G.	Elec. Eng. XI G.	Elec. Eng. VI G.				Elec. Eng. VI G.

VIII.	IX.	X.	XI.	I.		II.		III.	IV.
				Org. B.	Ch. V	Org. B.	Ch. V		
Thurs.	Met. II A.C.D. Org. Ch. V.	Bacteriology B.	Bacteriology B. Mech. Eng. IV A.D.E.G. Geol. VI C. Org. Ch. I D.	Gen. Chem. IV B.	Surv. VII C.	Gen. Chem. IV B.	Surv. VII C.	Ind. Ch. I(a) D. English II	
	Gen. Chem. IV B. Ch. Eng. I D. Geol. IX E. Thermo III F.G.	Hyd. Eng. I A.G. Ch. Eng. I D. Ind. Ch. I D. Mech. Eng. V F.	Ore Dressing D. Mech. Eng. VI F.	Ry. Eng. II, III E. Mech. Eng. V F. Mech. Eng. XI(a) F.	Ry. Eng. II, III E. Mech. Eng. V F. Met. III (b) D.	Ch. V B. Gen. Chem. IV B. Surv. VII C. Mining II A. Ch. Eng. I D. Ind. Ch. I(a) D.	Ch. V B. Gen. Chem. IV B. Surv. VII C. Mining II A. Ch. Eng. I D. Ind. Ch. I(a) D.		
Fri.	Milling A.D. Anal. Ch. VIII B. Mining I(a) C. Anal. Ch. VI D. Ry. Eng. II(a) E. Highway Eng. (b) E.	Milling A.D. Anal. Ch. VIII B. Ch. Eng. II D. Struct. Eng. IV E. Thermo IV F. Elec. Eng. VI(a) X. (b) G.	Milling A.D. Anal. Ch. VIII B. Geol. VII C. Ch. Eng. II D. Struct. Eng. IV E. Thermo IV F. Elec. Eng. X G.	Milling A.D. Str. Eng. I D. Str. Eng. II E. Thermo IV F. Elec. Eng. opt. G.	Milling A.D. Str. Eng. I D. Str. Eng. II E. Thermo IV F. Elec. Eng. opt. G.	Milling A.D. Str. Eng. I D. Str. Eng. II E. Thermo IV F. Elec. Eng. opt. G.	Milling A.D. Str. Eng. I D. Str. Eng. II E. Thermo IV F. Elec. Eng. opt. G.	Milling A.D. Str. Eng. I D. Str. Eng. II E. Thermo IV F. Elec. Eng. opt. G.	Engineering Society
	Milling A.D. Ch. Eng. II (a) D. Fire Assay B.D. Mun. Eng. E. Thermo III (a) F.G. Mech. Eng. VIII F.	Milling A.D. Ch. Eng. II (a) D. Fire Assay (b) B.D. Mun. Eng. E. Thermo III (a) F.G. Mech. Eng. VIII F.	Milling A.D. Ch. Eng. II (a) D. Fire Assay (b) B.D. Mun. Eng. E. Thermo III (a) F.G. Mech. Eng. VIII F.	Milling A.D. Str. Eng. I D. Str. Eng. II E. Thermo IV F. Elec. Eng. opt. G.	Milling A.D. Str. Eng. I D. Str. Eng. II E. Thermo IV F. Elec. Eng. opt. G.	Milling A.D. Str. Eng. I D. Str. Eng. II E. Thermo IV F. Elec. Eng. opt. G.	Milling A.D. Str. Eng. I D. Str. Eng. II E. Thermo IV F. Elec. Eng. opt. G.		
Sat.	Ch. Eng. II (a) D. Fire Assay B.D.	Ch. Eng. II (a) D. Fire Assay (b) B.D. Mun. Eng. E. Thermo III (a) F.G. Mech. Eng. VIII F.	Ch. Eng. II (a) D. Fire Assay (b) B.D. Mun. Eng. E. Thermo III (a) F.G. Mech. Eng. VIII F.	Ch. Eng. II (a) D. Fire Assay (b) B.D. Mun. Eng. E. Thermo III (a) F.G. Mech. Eng. VIII F.	Ch. Eng. II (a) D. Fire Assay (b) B.D. Mun. Eng. E. Thermo III (a) F.G. Mech. Eng. VIII F.	Ch. Eng. II (a) D. Fire Assay (b) B.D. Mun. Eng. E. Thermo III (a) F.G. Mech. Eng. VIII F.	Ch. Eng. II (a) D. Fire Assay (b) B.D. Mun. Eng. E. Thermo III (a) F.G. Mech. Eng. VIII F.	Milling A.D. Str. Eng. I D. Str. Eng. II E. Thermo IV F. Elec. Eng. opt. G.	Engineering Society
	Mech. Eng. X F.G.	Mech. Eng. X F.G.	Mech. Eng. X F.G.	Mech. Eng. X F.G.	Mech. Eng. X F.G.	Mech. Eng. X F.G.	Mech. Eng. X F.G.		

TIME TABLE YEAR.

	VIII	IX	X	XI	I	II	III	IV
Mon.								
Tues.								
Wed.								
Thurs.								
Fri.								
Sat.								

